



LDZ Shrinkage Factors
Final Estimates
Gas Year 2005/6

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1 LDZ Shrinkage Factor Estimates for Gas Year 2005/6

1.1 Purpose of Estimates

The purpose of this paper is to present our final estimates in respect of LDZ Shrinkage Factors for the Gas Year 2005/6 as required under section N of the Uniform Network Code.

In section N of Uniform Network Code, The Transporter has an obligation to set a LDZ Shrinkage Factor to provide for the gas that is used by each of its LDZ's or lost from its systems.

This paper is compiled following representations from system users at shrinkage forums on 6/7/05 and again on 15/8/05.

1.2 Summary of Estimates

The LDZ Shrinkage Factors, which are set out in the following table, 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 included 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 have been calculated on a national basis in co-operation with Transco. The calculations that were used to derive the Shrinkage factors and a summary of the underlying information are set out in this estimate.

The Shrinkage factors are to be used as the basis for Wales & West Utilities' LDZ shrinkage gas procurement during the Gas Year in question.

As in Gas Year 2004/5 the Shrinkage Factors set out in these estimates do not include Pressure or Temperature correction. Forecast consumption is based on 35 year weather corrected demand from gas year 2003/4

LDZ	Proposed Shrinkage Factor 2005/6
Wales North	0.68%
Wales South	0.56%
South West	0.92%

Note: the factors shown in the table are expressed as a percentage of LDZ Consumption.

1.3 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 2005/6 estimate.

1.3.1 Leakage

Leakage represents the largest component of the LDZ Shrinkage Factor.

For the purpose of analysis leakage may be conveniently split into three categories, which are:

- Distribution Mains (including service pipes);
- Above Ground Installations (AGI's) and
- Other losses

Distribution mains and service 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 estimate 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.

1.3.2 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 2002/3 National Leakage Testing programme with the following network¹ specific information:

- Current (year end 2004) records of 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, not administrative structure.

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

LDZ	Low Pressure Leakage	
	Tonnes ²	GWh
Wales North	2927	44
Wales South	7811	117
South West	19144	286
Total	29882	447

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

LDZ	Medium Pressure Leakage	
	Tonnes	GWh
Wales North	214	3
Wales South	801	12
South West	1637	24
Total	2652	39

1.3.3 AGI Emissions

The figures for leakage from Above Ground Installations have been taken from the findings of the 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 next table shows AGI Leakage on an LDZ basis

LDZ	AGI Emissions ³	
	Tonnes	GWh
Wales North	758	11
Wales South	2720	41
South West	1954	29
Total	5432	81

1.3.4 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”.

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 0.73 kg/cum.

³ Includes leakage and routine equipment venting

Statistics in respect of the number of broken mains and damages are used in conjunction with calculations on 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 this paper the number of events in 2004 have been used for the analysis together with emergency personnel response times from the first quarter of 2004.)

The table below shows the amount of gas lost as a result of other losses for the Wales & West LDZ's.

LDZ	Tonnes	GWh
WN	12.15	0.2
WS	45.52	0.7
SW	51.26	0.8
Total	108.93	1.7

1.3.5 Total Leakage

The next table shows the total amount of predicted leakage for Gas Year 2005/6 on an LDZ basis with the leakage expressed in tonnes, GWh and as a percentage of LDZ consumption.

LDZ	Leakage		
	Tonnes	GWh	Leakage as a % of Consumption
Wales North	3911	58	0.63%
Wales South	11378	170	0.50%
South West	22787	340	0.87%
Total / Weighted Average	38076	568	0.69%

1.4 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 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.

The Transco 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.

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%.

Wales & West Utilities has considered the Transco OUG methodology and has come to a similar conclusion.

A report published by Advantica in May 2002 concluded that OUG in 2000 was 0.0113% of throughput. 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 Wales & West Utilities to the opinion that the figure for OUG could be even lower.

Wales & West Utilities propose a conservative figure for Own Use Gas of 0.035% for the Gas Year 2005/6. This is a mid point compromise between the 0.06% used last year and the Advantica report figure of 0.0113%.

1.5 Theft of Gas

Uniform Network Code Section N 1.3.2 states that LDZ Shrinkage shall include, and Wales & West Utilities 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. Transco's 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 for 2004 indicate that of the cases of confirmed theft, 4.0% were identified as being its responsibility.

Historically, unidentified theft has been assumed to be 0.3% of LDZ Consumption, of which 10% is deemed to be Transco's responsibility, resulting in a theft of gas factor of 0.03%.

The statistics imply that theft is between 1% and 4%. Therefore a more realistic assessment would set the Theft of Gas factor at 0.012% (ie, 4% of 0.3% of LDZ throughput). However, as the industry is only aware of reported incidents and as a compromise with the 0.03% suggested by shippers after the 15/8/05 shrinkage forum, Wales & West Utilities proposes that the Theft of Gas factor be set at 0.02% for the Gas Year 2005/6.

1.6 LDZ Shrinkage Factor Summary

The proposed LDZ Shrinkage Factors for the Gas Year 2005/6 are presented in the following table.

LDZ	Leakage	Own Use Gas	Theft of Gas	Proposed Shrinkage factor 2005/6
Wales North	0.63%	0.035%	0.02%	0.68%
Wales South	0.50%	0.035%	0.02%	0.56%
South West	0.87%	0.035%	0.02%	0.92%
Weighted Average	0.69%	0.035%	0.02%	0.74%

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

1.7 Detailed Analysis

1.7.1 Leakage

In May 2003, Advantica, on behalf of Transco, completed an extensive programme of Leakage Tests. 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. The nature of these tests and their findings were described in last years' proposal, and will therefore not be re-described in this paper.

In the twelve months since Transco published the proposals for the 2004/5 Gas Year Wales & West Networks have:

During 2004, Wales & West Networks have:

- Replaced around 324km of metallic low pressure gas mains and associated metal services
- Replaced around 29km of metallic medium pressure gas mains and services

Despite these significant initiatives to reduce the amount of leakage, the volume of leakage that has been occurring has increased.

During summer 2004 Low Pressure Closed Loop Control was removed from ten North Wales conurbations as the running cost was assessed as uneconomic compared with the benefit achieved. We have also seen a reduction in measured MEG concentration⁴. These factors have a

⁴ 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

tendency to increase leakage and overall leakage has increased because the positive measures such as mains replacement have been outweighed.

1.7.2 Own Use Gas

In the past, Transco has presented details of the method whereby Own use gas is calculated. The 2005/6 estimates utilise this methodology, unchanged. Wales & West Utilities support the opinion, expressed at last years 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. Wales & West Utilities is also aware of a report, carried out by Advantica for Transco and published in 2002, which concluded for the calendar year 2000 was 0.0113%. Wales & West Utilities agree that, in the absence of individual DN statistics, a national figure is still appropriate for the application of OUG. Wales & West Utilities propose a conservative figure for Own Use Gas of 0.035% for the Gas Year 2005/6. This is a mid point compromise between the 0.06% used last year and the Advantica report figure of 0.0113%.

1.7.3 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 the LDZ throughput would have to continue to be used as the overall level of theft until better information becomes available.

The most recent Transco 2004 figures suggest that the proportion of theft for which Transco was responsible for managing was significantly less than 10% (the table in section 1.5 refers). This is consistent with an even lower figure in 2003.

The above statistics imply that theft is between 1% and 4%. Therefore a more realistic assessment would set the Theft of Gas factor at 0.012% (ie, 4% of 0.3% of LDZ throughput). However, as the industry is only aware of reported incidents and as a compromise with the 0.03% suggested by shippers after the 15/8/05 shrinkage forum, Wales & West Utilities proposes that the Theft of Gas factor be set at 0.02% for the Gas Year 2005/6.

1.8 *Extent to which the Estimates would better facilitate the relevant objectives*

This estimate provides an accurate estimate of LDZ Shrinkage factors for the Gas Year 2005/6. The gas usage and loss in transportation within the LDZ's will be reflective of actual conditions. This in turn facilitates the achievement of efficient and economic operation of the system through effective targeting of costs.

It will also lead to accurate targeting of costs to Users through the Reconciliation by Difference process and this is consistent with securing effective competition.

1.9 *The implications for Wales & West Utilities of implementing the Estimates including:*

a) Implications for operation of the System:

We are not aware of any such implications that would result from implementing this estimate.

b) Development and capital cost and operating cost implications:

The proposed LDZ Shrinkage factors (which have been prepared without Pressure and Temperature correction and in collaboration with Transco) may possibly be improved by studying P&T correction in future years, which would lead to a fairer allocation of operating costs between LDZ systems.

c) Extent to which it is appropriate for Wales & West Utilities to recover the costs, and proposal for the most appropriate way for Wales & West Utilities to recover the costs:

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

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

At this early stage of network ownership Wales & West Utilities are continuing to follow Transco's methodology for calculation of LDZ Shrinkage Factors. This will assist with making shrinkage performance comparisons between networks.

1.10 *The implications of implementing the Estimates for users*

This estimate improves the equitability and accuracy of cost targeting across all users.

1.11 *Analysis of any advantages or disadvantages on implementation of the Estimates*

- **Advantages:** Good representation of the actual system usage and losses leading to improved cost targeting.
- **Disadvantages:** Wales & West Utilities is not aware of any disadvantages

1.12 Summary of the representations (to the extent that the import of those representations are not reflected elsewhere in the Estimates)

Wales and West Utilities have responded to points raised by users in reply to its initial proposals. In particular during the shrinkage forums of 6/7/05 and 15/8/05

1.13 Programme of works required as a consequence of implementing the Estimates

The only required modification is to the LDZ Shrinkage Factor values entered into AT Link

1.14 Proposed implementation timetable (including timetable for any necessary information system changes)

Users have until 15th of September 2005 to request that Ofgem issue a Condition 7(4) disapproval of this estimate. (This provision is in the Uniform Network Code Section N 3.1.8).

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

1.15 Recommendation concerning the implementation of the Estimates

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

1.16 Wales & West Utilities Estimates

This report contains our final estimates for the LDZ Shrinkage Factors for the Gas Year 2005/06

Appendix 1. LP Pipe and Service Leakage Analysis 2003 to 2004

This section of the document provides a comparison of the assessed levels of LP pipe and service leakage by LDZ. Users have requested more detail with regard to leakage assessment to be presented within LDZ Shrinkage Factor proposals.

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.

We have supplied 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 will allow Users to compare the effective operating pressures of the different LDZ's.

Table 1 Wales North LDZ

	2003	2004
Leakage (GWh)	36	44
Annual Average System Pressure	36.54 mbarg	42.11 mbarg
ASP (All-PE systems excluded)	35.58 mbarg	41.93 mbarg
MEG Saturation Level	0%	0%

Table 2 Wales South LDZ

	2003	2004
Leakage (GWh)	113	117
Annual Average System Pressure	31.54 mbarg	31.20 mbarg
ASP (All-PE systems excluded)	30.55 mbarg	30.87 mbarg
MEG Saturation Level	0%	0%

System Pressures and hence leakage has increased in Wales North due to the removal of Low Pressure Electronic Control schemes for economic reasons. System pressures (for non PE systems) have also risen in Wales South, resulting in higher leakage for 2004. These LDZ's do not treat lead yarn jointed iron mains with Monoethylene Glycol (MEG). The benefit of mains replacement is also present in the leakage figures.

Table 3 South West LDZ

	2003	2004
Leakage (GWh)	281	286
Annual Average System Pressure	36.35 mbarg	36.29 mbarg
ASP (All-PE systems excluded)	35.70 mbarg	35.84 mbarg
MEG Saturation Level	16.47%	8.02%

South West LDZ has seen a slight increase in system pressures for non PE systems and taken together with a reduction in MEG saturation has produced a rise in leakage for 2004. The benefit of mains replacement is also present in the figures.

Appendix 2. Flow-weighted Average Calorific Values (CV's) for each LDZ for 2003 & 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 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/cum)	
	2003	2004
Wales North	39.20	39.08
Wales South	39.29	39.23
South West	39.31	39.22