

LDZ Shrinkage Initial Proposals Gas Year 2008/09

**Scotia Gas Networks
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Scotia Gas Networks LDZ Shrinkage Initial Proposals - Gas Year 2008/09

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LDZ Shrinkage Initial Proposal for Gas Year 2008/09

1. Purpose of Proposal

The purpose of this paper is to present our initial Shrinkage proposals for the Gas Year 2008/09. Under Section N of the Uniform Network Code (UNC), Scotia Gas Networks has an obligation to estimate Shrinkage quantity values to provide for the gas that is used by Scotia Gas Networks LDZs, or lost from its LDZ systems.

The Scotia Gas Networks Initial Proposals for Gas Year 2008/09 has been produced in line with the new shrinkage arrangements in the revised gas transporter licences (covering the period 1 April 2008 to 31 March 2013) and the UNC, which was aligned to the licence conditions by the approval of UNC Modification Proposal 0203V.

The most significant change in the Shrinkage process is that Shrinkage quantities rather than Shrinkage factors are to be estimated for each gas year as Shrinkage has been deemed not to be linked to throughput.

It should also be noted that in this paper the Scottish Independent Networks of Thurso, Wick, Campbeltown, Oban and Stranraer have their shrinkage quantities detailed separately. This is because, for the purposes of the UNC and in line with section A paragraph 1.7.4 (a), each Scottish Network is treated as a separate LDZ.

2. Summary of Proposal

Due to the recent approval of UNC Modification Proposal 0203V Shrinkage quantities, rather than Shrinkage factors, are to be estimated for each gas year. Thus, as Shrinkage has been deemed not to be linked to throughput, Shrinkage is to be procured as a fixed daily LDZ Shrinkage Quantity throughout the Gas Year. Table 1, on the following page, shows the proposed yearly shrinkage quantities - and the resultant daily Shrinkage quantities for information;

LDZ	Proposed Yearly Shrinkage Quantities 2008/09 (GWh)	Resultant Fixed Daily Shrinkage Quantities 2008/09 (kWh)
Scotland	287	787,000
Thurso	0.20	557
Wick	0.13	358
Campbeltown	0.11	290
Oban	0.29	793
Stranraer	0.38	1046
South East	448	1,227,637
Southern	301	824,289

Table 1. Proposed Shrinkage quantity values for Gas Year 2008/09 and resultant daily quantities

The LDZ Shrinkage quantities reflect the losses associated with leakage, theft of gas and gas used in the operation of the system. Details of how these quantities have been determined, and a summary of the underlying information, 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. Gas used in the operation of the system and theft of gas has been calculated on a national basis and Scotia Gas Networks has used the output of that assessment.

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 2008/09 proposal.

3.1 Leakage

Leakage represents the largest component of the LDZ Shrinkage Quantity.

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

- 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.

Other losses include gas lost as a result of interference damage and broken mains. These losses are not continuous as 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 (carried out by Transco) with the following network¹ specific information:

- forecasted mains replacement up to the end of March 2009;
- the annual average system pressure in each network;
- 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 is detailed in section 4.1 (page 8).

Table 2, below, shows the estimated 2008/09 LDZ low pressure leakage on an LDZ basis.

LDZ	Low Pressure Leakage	
	Tonnes ²	GWh
Scotland	14,299	217
Thurso	6	0.088
Wick	1	0.017
Campbeltown	6	0.090
Oban	9	0.13
Stranraer	17	0.26
South East	25,367	377
Southern	15,125	226

Table 2. Estimated 2008/09 LDZ Low Pressure Leakage

¹ Network in this context relates to physical interconnected pipe systems, not Scotia Gas Networks administrative structure.

² The tonnes figure is provided for information (it has no purpose in respect of calculating the Shrinkage quantities). The conversion to tonnes is based on a gas density of 0.73kg/m³.

Table 3, below, shows the estimated 2008/09 LDZ medium pressure leakage on an LDZ basis.

LDZ	Medium Pressure Leakage	
	Tonnes	GWh
Scotland	1,079	16
Thurso	0.18	0.0028
Wick	0.09	0.0015
Campbeltown	0	0
Oban	3.45	0.052
Stranraer	0.28	0.0043
South East	1,090	16
Southern	1,871	28

Table 3. Estimated 2008/09 LDZ Medium Pressure Leakage

3.1.2 AGI Leakage

The figures for leakage from Above Ground Installations have been based on the findings of the 2003 Above Ground Installation Leakage Test programme (carried out by Transco).

Information relating to the programme has already been shared with Users and Ofgem and, consequently, details are not included in this paper.

Table 4, below, shows the estimated 2008/09 AGI leakage on an LDZ basis.

LDZ	AGI Emissions ³	
	Tonnes	GWh
Scotland	2,301	35
Thurso	6.5	0.1
Wick	6.5	0.1
Campbeltown	0.4	0
Oban	6.5	0.1
Stranraer	5.4	0.1
South East	2,124	32
Southern	2,164	32

Table 4. Estimated 2008/09 AGI Leakage

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.

³ Includes leakage and routine equipment venting

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.

Table 5 below shows the estimated 2008/09 amount of gas lost as a result of other losses on a LDZ basis;

LDZ	Other Losses	
	Tonnes	GWh
Scotland	93	1
Thurso	0	0
Wick	0	0
Campbeltown	0	0
Oban	0	0
Stranraer	0	0
South East	87	1
Southern	70	1

Table 5. Estimated 2008/09 Other Losses

3.1.4 Total Leakage

Table 6 below shows the total amount of estimated leakage for Gas Year 2008/09 on an LDZ basis;

LDZ	2008/09 Total Yearly Leakage	
	Tonnes	GWh
Scotland	17,763	269
Thurso	12.36	0.19
Wick	7.66	0.12
Campbeltown	6.29	0.1
Oban	18.40	0.28
Stranraer	22.52	0.34
South East	28,671	426.6
Southern	19,230	286.8

Table 6. Estimated 2008/09 Total Leakage

3.2 Own Use Gas

Natural gas is a compressible fluid, and 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 equipment⁴.

The amount of fuel required for pre-heating (Own Use Gas) is estimated by applying the industry standard thermodynamic equations, LDZ throughput and system pressures together with assumptions about the efficiency of the pre-heating equipment.

Own Use Gas (OUG), under the new UNC regime, is now treated as a consolidated quantity which is estimated by applying a OUG factor to forecasted demand for the gas year.

The OUG factor Scotia Gas Networks proposes to use is the national average of 0.0113% which was determined by Advantica in 2002 and was verified by subsequent research in 2006 – the results of this research being presented to the Shrinkage Forum on Thursday 22nd June 2006.

This research stated that pre-heater efficiencies lie between 53-69%. This implies that the national factor calculated by their model is overstated, as this is based on a lower efficiency of 50%. However Scotia Gas Networks has used this national factor of 0.0113% to determine its estimated 2008/09 OUG quantities – which are shown in table 7 below;

LDZ	2008/09 Yearly Own Use Gas	
	Tonnes	GWh
Scotland	435	7
Thurso	0.37	0.0057
Wick	0.35	0.0053
Campbeltown	0.25	0.0039
Oban	0.26	0.0039
Stranraer	0.97	0.015
South East	522	8
Southern	339	5

Table 7. Estimated 2008/09 Own Use Gas Quantities

The quantification of Own Use Gas remains under review by the Shrinkage Forum. Thus we highlight that our final OUG quantities are subject to change before the final Shrinkage proposals for 2008/09 are published.

3.3 Theft of Gas

Uniform Network Code Section N 1.3.2 states that LDZ Shrinkage shall include, and the Transporter is therefore responsible for, gas illegally taken upstream of the customer control valve and downstream where there is no

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

shipper contract with the end-user. The statistics for confirmed Theft of Gas for 2007 are detailed in table 8 below.

	2007	
	Total	Transporter Responsible
Cases Of Confirmed Theft Made Known To SGN	554	75 (13.5%)

Table 8. 2007 Theft of Gas Statistics

The statistics for 2007 indicate that of the cases of confirmed theft made known to Transco, 13.5% were identified as being the Transporters' responsibility.

As with Own Use Gas – Theft of Gas (TOG), under the new UNC regime, is now treated as a consolidated quantity which is estimated by applying a TOG factor to forecasted demand for the gas year.

The TOG factor Scotia Gas Networks proposes to use, to determine its estimated 2008/09 TOG quantities which are shown in table 9 below, is 0.02% - in line with the proposed level at the Shrinkage Gas Forum on 15th August 2005.

LDZ	2008/09 Yearly Theft of Gas	
	Tonnes	GWh
Scotland	770	12
Thurso	0.7	0.010
Wick	0.6	0.0094
Campbeltown	0.5	0.0068
Oban	0.5	0.0069
Stranraer	1.7	0.026
South East	924	14
Southern	601	9

Table 9. 2008/09 Theft of Gas Quantities

However the quantification of the level of theft and proportion attributable to Transporters remains under review – both in the Shrinkage Gas Forum and Theft of Gas Forum. Thus we highlight that our final TOG quantities are subject to change before the final Shrinkage proposals for 2008/09 are published.

3.4 LDZ Shrinkage Quantity Summary

The proposed LDZ Shrinkage quantities for the Gas Year 2008/09 are presented in table 10 below.

LDZ	08/09 Yearly Leakage (GWh)	08/09 Yearly Own Use Gas (GWh)	08/09 Yearly Theft of Gas (GWh)	08/09 Yearly Shrinkage (GWh)
Scotland	269	7	12	287
Thurso	0.19	0.0057	0.010	0.20
Wick	0.12	0.0053	0.0094	0.13
Campbeltown	0.1	0.0039	0.0068	0.11
Oban	0.28	0.0039	0.0069	0.29
Stranraer	0.34	0.015	0.026	0.38
South East	427	8	14	448
Southern	287	5	9	301

Table 10. Estimated 2008/09 Total Shrinkage Quantities

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) were 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 previously 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 previously 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 was previously circulated to Ofgem and Users.

In addition to testing distribution mains, Transco also tested 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 test programmes provide a firm basis for assessing the leakage from both the distribution mains and AGIs; consequently, Scotia 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 initial Shrinkage Factor proposals for the 2007/08 Gas Year, around 1024 km of metallic gas main and associated metallic gas service pipes have been replaced.

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

This proposal provides an accurate estimate of LDZ Shrinkage quantities for the Gas Year 2008/09. As a result, the gas usage and loss in transportation within the LDZs 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 better targeting of costs to Users through the RbD process and this is consistent with securing effective competition.

6. **The implications for Scotia 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 quantities lead to a fair allocation of operating costs for the LDZ systems.

c) **Extent to which it is appropriate for Scotia Gas Networks to recover the costs, and proposal for the most appropriate way for Scotia 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 proposal is consistent with the establishment and operation of Distribution Network specific transportation charging formula.

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:** Better reflective of the actual system usage and losses with improved cost targeting.
- **Disadvantages:** Scotia 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)

This paper outlines our initial proposals. We appreciate hearing the views of Ofgem and Users; these views will help inform our final proposals (that are due to be published on the 1st of September 2008.)

It would be appreciated if Users could let us have any feed-back that they would like to share with us before the 1st of August 2008 as in that way we will be able to better respond to any concerns.

Note: Due to the pressure of time it will be difficult to respond to any points that might be raised at the end of August because the Uniform Network Code requires Transporters to publish their proposals on the 1st of September.

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

The only required modification is the input of LDZ daily Shrinkage quantity values into GEMINI.

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

When we publish our final proposals, Users have until the 15th of September 2008 to request that Ofgem issue a Condition 7(4) disapproval of this proposal. (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 daily Shrinkage quantities from 06:00 hrs on the 1st of October 2008.

12. Recommendation concerning the implementation of the Proposal

We recommend the proposed LDZ daily Shrinkage quantities be implemented with effect from 06:00 hrs on the 1st October 2008.

13. Scotia Gas Networks' Proposal

This report contains our proposal for the LDZ daily shrinkage quantities for the Gas Year 2008/09.

Appendix 1. Mains and Service Leakage Analysis 2007/08 to 2008/09 proposals 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 2008/09 with 2007/08 for comparison purposes. The levels quoted are only those attributable to low pressure mains and service leakage.

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.

Please note that the shrinkage data for the Scottish Independent Networks of Thurso, Wick, Campbeltown, Oban and Stranraer is being detailed separately for the first time in the 2008/09 Shrinkage proposals, therefore no comparable data is shown.

A1.1 Scotland LDZ

	2007/08 Proposal	2008/09 Proposal
Leakage (GWh)	218	217
Annual Average System Pressure (mbar)	30.11	29.74
ASP (All-PE systems excluded)	28.1	28.53
MEG Saturation Level (%)	41.69	34.00

Table A1.1 Scotland LDZ

Average system pressure has decreased by 0.37 mbar between 2006 and 2007. MEG saturation levels have fallen by 7.69%.

A1.2 Thurso

	2008/09 Proposal
Leakage (GWh)	0.09
Annual Average System Pressure (mbar)	29.83
ASP (All-PE systems excluded)	29.83
MEG Saturation Level (%)	0

Table A1.2 Thurso LDZ

A1.3 Wick

	2008/09 Proposal
Leakage (GWh)	0.02
Annual Average System Pressure (mbar)	30.79
ASP (All-PE systems excluded)	30.79
MEG Saturation Level (%)	0

Table A1.3 Wick LDZ

A1.4 Campbeltown

	2008/09 Proposal
Leakage (GWh)	0.09
Annual Average System Pressure (mbar)	29.54
ASP (All-PE systems excluded)	29.54
MEG Saturation Level (%)	0

Table A1.4 Campbeltown LDZ

A1.5 Oban

	2008/09 Proposal
Leakage (GWh)	0.13
Annual Average System Pressure (mbar)	31.48
ASP (All-PE systems excluded)	31.48
MEG Saturation Level (%)	0

Table A1.5 Oban LDZ

A1.6 Stranraer

	2008/09 Proposal
Leakage (GWh)	0.26
Annual Average System Pressure (mbar)	30.45
ASP (All-PE systems excluded)	30.45
MEG Saturation Level (%)	0

Table A1.6 Stranraer LDZ

A1.7 South East LDZ

	2007/08 Proposal	2008/09 Proposal
Leakage (GWh)	389	377
Annual Average System Pressure (mbar)	27.77	27.85
ASP (All-PE systems excluded)	27.48	27.26
MEG Saturation Level (%)	7.66	1.97

Table A1.7 South East LDZ

Average system pressure has increased by 0.08 mbar between 2006 and 2007. MEG saturation levels have fallen by 5.69%

A1.8 Southern LDZ

	2007/08 Proposal	2008/09 Proposal
Leakage (GWh)	237	226
Annual Average System Pressure (mbar)	32.59	32.98
ASP (All-PE systems excluded)	31.87	31.61
MEG Saturation Level (%)	7.52	0

Table A1.8 Southern LDZ

Average system pressure has increased by 0.39 mbar between 2006 and 2007. MEG saturation levels have decreased by 7.52%

Appendix 2. Flow-Weighted Average Calorific Values (CVs) for each LDZ for 2006 and 2007

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 2007. 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 2006 for comparison purposes.

LDZ	Average Calorific Values (MJ/m³)	
	2006	2007
Scotland	39.94	39.80
Thurso	39.94	39.80
Wick	39.94	39.80
Campbeltown	39.94	39.80
Oban	39.94	39.80
Stranraer	39.94	39.80
South East	39.30	39.10
Southern	39.23	39.20