LDZ Shrinkage Quantity
Initial Proposals
Formula Year 2009/10

Scotia Gas Networks
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Scotia Gas Networks LDZ Shrinkage Initial Proposals - Formula Year 2009/10

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LDZ Shrinkage Initial Proposal for Formula Year 2009/10

1. Purpose of Proposal

The purpose of this paper is to present our proposals in respect of Scotia Gas Networks Shrinkage for the Formula Year 2009/10. 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 Formula Year 2009/10 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 was that Shrinkage quantities rather than Shrinkage factors are to be estimated as Shrinkage has been deemed not to be linked to throughput.

An additional UNC Modification Proposal 0225 has recently been approved by Ofgem which further aligned the UNC process to the new Licence Conditions in respect of the timing of shrinkage calculations. The Mod moved the Shrinkage process from Gas Year to Formula Year to ensure consistency with the Shrinkage Revenue Incentive in the Gas Transporter Licences.

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 approval of UNC Modification Proposal 0203V Shrinkage quantities, rather than Shrinkage factors are to be estimated for each Formula 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 Formula Year. Table 1, on page 2, shows the proposed yearly shrinkage quantities and the resultant daily Shrinkage quantities for information.

The LDZ Shrinkage Quantity values, which are set out within table 1 (page 2) 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.

LDZ	Proposed Shrinkage Quantities 2009/10 (GWh)	Resultant Fixed Daily Shrinkage Quantities 2009/10 (kWh)
Scotland	273	747,945
Thurso	0.20	548
Wick	0.13	356
Campbeltown	0.11	301
Oban	0.29	795
Stranraer	0.38	1041
South East	421	1,153,425
Southern	288	789,041

Table 1. Proposed Shrinkage quantity values for 2009/10 Formula Year and resultant daily quantities

3. Component Analysis

This section of the document presents an analysis of the components of LDZ Shrinkage that make up the estimates for the Formula Year 2009/10 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. (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 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 network[1] specific information:

- forecasted mains replacement up to the end of March 2010;
- the annual average system pressure in each network;
- the measured concentration of Monoethylene Glycol (MEG) joint treatment chemical in the gas and

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.

Table 2, below shows the Low Pressure leakage on an LDZ basis:

LDZ	Low Pressure Leakage	
	Tonnes[2]	GWh
Scotland	13,396	203
Thurso	5.8	0.088
Wick	1.2	0.017
Campbeltown	6.0	0.090
Oban	8.6	0.13
Stranraer	17	0.26
South East	23,540	350
Southern	14,204	212

Table 2. Estimated LDZ Low Pressure Leakage for 2009/10 Formula Year

[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/m^3.

Table 3 below shows the estimated Medium Pressure leakage on an LDZ basis:

LDZ	Medium Pressure Leakage	
	Tonnes	GWh
Scotland	1,060	16
Thurso	0.19	0.0028
Wick	0.099	0.0015
Campbeltown	0.00	0.00
Oban	3.5	0.052
Stranraer	0.29	0.0043
South East	1,070	16
Southern	1,836	27

Table 3. Estimated LDZ Medium Pressure Leakage for 2009/10 Formula Year

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.

Information relating to the programme has already been shared with Users and Ofgem at the Shrinkage Forums held in 2003; consequently it is not proposed to include significant detail in this paper.

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

LDZ	AGI Emissions[3]	
	Tonnes	GWh
Scotland	2,324	35
Thurso	6.5	0.097
Wick	6.5	0.097
Campbeltown	0.38	0.0057
Oban	6.5	0.097
Stranraer	5.4	0.082
South East	2,145	32
Southern	2,186	33

Table 4. Estimated AGI Emissions for 2009/10 Formula Year

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 amount of gas lost as a result of other losses on a LDZ basis which is proposed as the estimate for 2009/10:

LDZ	Other Losses	
	Tonnes	GWh
Scotland	84	1.2
Thurso	0.00	0.00
Wick	0.00	0.00
Campbeltown	0.00	0.00
Oban	0.00	0.00
Stranraer	0.00	0.00
South East	78	1.2
Southern	63	0.94

Table 5. Estimated 2009/10 Other Losses

3.1.4 Total Leakage

Table 6 below shows the total amount of estimated leakage for Formula Year 2009/10 on an LDZ basis;

LDZ	2009/10 Total Yearly Leakage	
	Tonnes	GWh
Scotland	16,864	255
Thurso	12	0.19
Wick	7.7	0.12
Campbeltown	6.3	0.095
Oban	19	0.28
Stranraer	23	0.34
South East	26,834	399
Southern	18,288	273

Table 6. Estimated 2009/10 Formula Year LDZ 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 equipment[4].

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 Formula 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 2009/10 OUG quantities – which are shown in table 7 below;

LDZ	2009/10 Yearly Own Use Gas	
	Tonnes	GWh
Scotland	443	6.7
Thurso	0.38	0.0057
Wick	0.35	0.0053
Campbeltown	0.26	0.0039
Oban	0.26	0.0039
Stranraer	0.98	0.015
South East	544	8.1
Southern	345	5.1

Table 7. Estimated 2009/10 LDZ Own Use Gas Quantity Values

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

3.3 Theft of Gas

Uniform Network Code Section N 1.3.2 states that LDZ Shrinkage shall include, and Scotia 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 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 Formula Year.

The TOG factor Scotia Gas Networks proposes to use, to determine its estimated 2009/10 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	785	11.89
Thurso	0.67	0.010
Wick	0.63	0.0094
Campbeltown	0.45	0.0068
Oban	0.46	0.0069
Stranraer	1.7	0.026
South East	964	14.35
Southern	610	9.1

Table 9. Estimated 2009/10 LDZ Theft of Gas Quantity Values

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 2009/10 are published.

3.4 LDZ Shrinkage Quantity Summary

The proposed LDZ Shrinkage quantities for the Formula Year 2009/10 are presented in table 10 below:

LDZ	09/10 Yearly Leakage (GWh)	09/10 Yearly Own Use Gas (GWh)	09/10 Yearly Theft of Gas (GWh)	09/10 Yearly Shrinkage (GWh)
Scotland	255	6.7	11.89	273
Thurso	0.19	0.0057	0.010	0.20
Wick	0.12	0.0053	0.0094	0.13
Campbeltown	0.10	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	399	8.1	14.35	421
Southern	273	5.1	9.1	288

Table 10. Estimated 2009/10 LDZ Shrinkage Quantity Values

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.

These test programmes provide a firm basis for assessing the leakage for AGIs and the distribution mains and this information has been used 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 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 Formula Year.

We believe that the recent 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 addition, we have continued to replace iron mains in line with the Scotia Gas Networks main replacement policy. These proposals assume an estimated amount of mains replacement for the 2009/10 leakage assessment, which is approximately 1088km per annum. This should have significant reductions on the amount of leakage.

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

This proposal provides an accurate estimate of LDZ Shrinkage quantities for the Formula Year 2009/10. 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 March 2009.)

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 February 2009 as in that way we will be able to better respond to any concerns.

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 March 2009 to request that Ofgem issue a Standard Special Condition A11 (18) 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 Shrinkage Quantity values from 06:00 hrs on the 1st of April 2009.

12. Recommendation concerning the implementation of the Proposal

We recommend the proposed LDZ daily Shrinkage Quantity values be implemented with effect from 06:00 hrs on the 1st April 2009.

13. Scotia Gas Networks' Proposal

This report contains our proposal for the LDZ daily shrinkage quantity values for the Formula Year 2009/10.

Appendix 1. Mains and Service Leakage Analysis 2008 to 2009 by LDZ

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 Scotia Gas Networks 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 2009 with 2008 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.

A1.1 Scotland LDZ

	2008/09 Proposal	2009/10 Proposal
Leakage (GWh)	217	203
Annual Average System Pressure (mbar)	29.20	28.60
ASP (All-PE systems excluded)	28.02	27.51
MEG Saturation Level (%)	34.00%	32.00%

Table A1.1 Scotland LDZ

A1.2 Thurso

	2008/09 Proposal	2009/10 Proposal
Leakage (GWh)	0.19	0.19
Annual Average System Pressure (mbar)	29.83	29.83
ASP (All-PE systems excluded)	29.83	29.83
MEG Saturation Level (%)	0	0

Table A1.2 Thurso LDZ

A1.3 Wick

	2008/09 Proposal	2009/10 Proposal
Leakage (GWh)	0.12	0.12
Annual Average System Pressure (mbar)	30.79	30.79
ASP (All-PE systems excluded)	30.79	30.79
MEG Saturation Level (%)	0%	0%

Table A1.3 Wick LDZ

A1.4 Campbeltown

	2008/09 Proposal	2009/10 Proposal
Leakage (GWh)	0.10	0.10
Annual Average System Pressure (mbar)	29.54	29.54
ASP (All-PE systems excluded)	29.54	29.54
MEG Saturation Level (%)	0%	0%

Table A1.4 Campbeltown LDZ

A1.5 Oban

	2008/09 Proposal	2009/10 Proposal
Leakage (GWh)	0.28	0.28
Annual Average System Pressure (mbar)	31.48	31.48
ASP (All-PE systems excluded)	31.48	31.48
MEG Saturation Level (%)	0%	0%

Table A1.5 Oban LDZ

A1.6 Stranraer

	2008/09 Proposal	2009/10 Proposal
Leakage (GWh)	0.34	0.34
Annual Average System Pressure (mbar)	30.45	30.45
ASP (All-PE systems excluded)	30.45	30.45
MEG Saturation Level (%)	0%	0%

Table A1.6 Stranraer LDZ

A1.7 South East LDZ

	2008/09 Proposal	2009/10 Proposal
Leakage (GWh)	377	350
Annual Average System Pressure (mbar)	27.35	26.85
ASP (All-PE systems excluded)	26.77	26.28
MEG Saturation Level (%)	1.97	4.92

Table A1.7 South East LDZ

A1.8 Southern LDZ

	2008/09 Proposal	2009/10 Proposal
Leakage (GWh)	226	212
Annual Average System Pressure (mbar)	32.39	31.8
ASP (All-PE systems excluded)	31.05	30.49
MEG Saturation Level (%)	0%	0%

Table A1.8 Southern LDZ

Appendix 2. Flow-Weighted Average Calorific Values (CVs) for each LDZ for 2008 and 2009

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 2009. 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 2008 for comparison purposes.

LDZ	Average Calorific Values (MJ/m^3)	
	2008/09	2009/10
Scotland	39.80	39.94
Thurso	39.80	39.94
Wick	39.80	39.94
Campbeltown	39.80	39.94
Oban	39.80	39.94
Stranraer	39.80	39.94
South East	39.10	39.30
Southern	39.20	39.23