LDZ Shrinkage Quantity
Initial Proposals
Formula Year 2012/13

Scotia Gas Networks
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Scotia Gas Networks LDZ Shrinkage Initial Proposals - Formula Year 2012/13

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LDZ Shrinkage Initial Proposal for Formula Year 2012/13

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 2012/13. 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 2012/13 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.

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.

Fugitive emissions of gas have been calculated on an LDZ basis using a forecasted mains population to the end of 1st April 2013 omitting NG Metering sites. SGN has considered Theft of Gas and propose using the same factor as last year. 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.

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	Proposed Shrinkage Quantities 2012/13 (GWh)	Resultant Fixed Daily Shrinkage Quantities 2012/13 (kWh)
LDZ		
Scotland	245	670,447
Thurso	0.26	700
Wick	0.23	625
Campbeltown	0.25	689
Oban	0.38	1,031
Stranraer	0.36	975
South East	373	1,023,215
Southern	253	692,470

Table 1. Proposed Shrinkage quantity values for 2012/13 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 2012/13 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

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National Leakage Testing programme (carried out by Transco) with the following network[1] specific information:

- forecasted mains replacement up to the end of March 2013;
- 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	11,576	176
Thurso	9	0.14
Wick	8	0.11
Campbeltown	10	0.15
Oban	14	0.21
Stranraer	15	0.23
South East	20,393	305
Southern	11,981	179

Table 2. Estimated LDZ Low Pressure Leakage for 2012/13 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/m3.

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

LDZ	Medium Pressure Leakage	
	Tonnes	GWh
Scotland	1,061	16
Thurso	0.19	0.003
Wick	0.10	0.002
Campbeltown	0.00	0.00
Oban	3.48	0.053
Stranraer	0.26	0.004
South East	981	15
Southern	1,900	28

Table 3. Estimated LDZ Medium Pressure Leakage for 2012/13 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	2,352	36
Thurso	6.46	0.10
Wick	6.47	0.10
Campbeltown	6.00	0.09
Oban	6.46	0.10
Stranraer	5.42	0.08
South East	2,309	35
Southern	2,184	33

Table 4. Estimated AGI Emissions for 2012/13 Formula Year

[3] Includes leakage and routine equipment venting

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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.

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 2012/13:

LDZ	Other Losses	
	Tonnes	GWh
Scotland	48	1
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	45	1
Southern	57	1

Table 5. Estimated 2012/13 Other Losses

3.1.4 Total Leakage

Table 6 below shows the total amount of estimated leakage for Formula Year 2012/13 on an LDZ basis;

LDZ	2012/13 Total Yearly Leakage	
	Tonnes	GWh
Scotland	15,036	228
Thurso	15.83	0.24
Wick	14.11	0.21
Campbeltown	15.85	0.24
Oban	24.08	0.37
Stranraer	20.59	0.31
South East	23,728	354
Southern	16,121	240

Table 6. Estimated 2012/13 Formula Year LDZ Total Leakage

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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 2012/13 OUG quantities – which are shown in table 7 below;

[4] Includes leakage and routine equipment venting

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LDZ	2012/13 Yearly Own Use Gas	
	Tonnes	GWh
Scotland	418	6.0
Thurso	0.36	0.0054
Wick	0.32	0.0049
Campbeltown	0.25	0.0038
Oban	0.25	0.0037
Stranraer	1.02	0.016
South East	452	6.7
Southern	295	4.4

Table 7. Estimated 2012/13 LDZ Own Use Gas Quantity Values

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 2008 are detailed in table 8 below.

	2010/11	
	Total	Transporter Responsible
Cases Of Confirmed Theft Made Known To SGN	282	23 (8.16%)

Table 8. 2010/11 Theft of Gas Statistics

The statistics for 2010/11 indicate that of the cases of confirmed theft made known to Transco, 8.16% 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 2012/13 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.

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LDZ	2012/13 Yearly Theft of Gas	
	Tonnes	GWh
Scotland	714	11
Thurso	0.63	0.0096
Wick	0.58	0.0087
Campbeltown	0.44	0.0067
Oban	0.43	0.0066
Stranraer	1.81	0.0276
South East	833	12
Southern	553	8

Table 9. Estimated 2012/13 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 2012/13 are published.

3.4 LDZ Shrinkage Quantity Summary

The proposed LDZ Shrinkage quantities for the Formula Year 2012/13 are presented in table 10 below:

LDZ	12/13 Yearly Leakage (GWh)	12/13 Yearly Own Use Gas (GWh)	12/13 Yearly Theft of Gas (GWh)	12/13 Yearly Shrinkage (GWh)
Scotland	228	6.0	11	245
Thurso	0.24	0.0054	0.0096	0.26
Wick	0.21	0.0049	0.0087	0.23
Campbeltown	0.24	0.0038	0.0067	0.25
Oban	0.37	0.0037	0.0066	0.38
Stranraer	0.31	0.016	0.0276	0.36
South East	354	6.7	12	373
Southern	240	4.4	8	253

Table 10. Estimated 2012/13 LDZ Shrinkage Quantity Values

4. <u>Detailed Analysis</u>

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.

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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 2012/13 leakage assessment. This should have significant reductions on the amount of leakage.

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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 2012/13. 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.

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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)

N/A

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 2012 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 2012.

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 2012.

13. Scotia Gas Networks' Proposal

This report contains our proposal for the LDZ daily shrinkage quantity values for the Formula Year 2012/13.

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Appendix 1. Flow-Weighted Average Calorific Values (CVs) for each LDZ for 2011/12 and 2012/13

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 2012. 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 2011 for comparison purposes.

LDZ	Average Calorific Values (MJ/m^3)	
	2011/12	2012/13
Scotland	39.94	39.94
Thurso	39.94	39.94
Wick	39.94	39.94
Campbeltown	39.94	39.94
Oban	39.94	39.94
Stranraer	39.94	39.94
South East	39.10	39.10
Southern	39.24	39.24

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