



## **Shrinkage and Leakage Model Review No 1**

Consultation on Northern Gas Networks Shrinkage and Leakage  
Model Review 2013/14  
November 2013

Date of Publication:	29 November 2013
Deadline for Response:	27 December 2013
Target Audience:	Gas Distribution Network Operators, Shippers, and any Other interested parties with an interest in the estimation of Emissions from gas distribution systems

# NORTHERN GAS NETWORKS SLM REVIEW 2013/14

Overview: .....	3
Purpose of Document: .....	3
Summary .....	3
1. Introduction .....	4
1.1 Background .....	4
1.2 Responding to this consultation .....	4
2. Components of the Shrinkage and Leakage Model .....	4
2.1 Leakage Model Components .....	4
2.1.1 Low Pressure (LP) mains leakage (61% of leakage) .....	4
2.1.2 Low Pressure Service Calculation (16% of leakage) .....	4
2.1.3 Medium Pressure (MP) Leakage (7% of leakage) .....	5
2.1.4 AGI Leakage (10% of leakage) .....	5
2.1.5 AGI Venting (5% of leakage) .....	6
2.1.6 Interference Damage (0.4% of leakage) .....	6
2.2 Theft of Gas (0.02% of Shrinkage) .....	6
2.3 Own Use Gas (0.0113% of Shrinkage) .....	6
3. Smart metering .....	7
4. Outcome of SLM Review .....	7
5. Consultation Responses .....	7

# NORTHERN GAS NETWORKS SLM REVIEW 2013/14

## Overview:

Northern Gas Networks has an obligation under Special Condition 1F Part E of its Licence to review the Shrinkage and Leakage Model (SLM) on an annual basis and to consult on the outcome of that review with other DN Operators, gas shippers and other interested parties.

The purpose of this review, 'the SLM Review', is to assess how the SLM can better achieve the objectives of the set in in paragraph 1F.13 of the Licence, "The Shrinkage and Leakage Model must be designed to facilitate the accurate calculation and reporting of gas Shrinkage and gas Leakage in or from each Distribution Network operated by the Licensee."

This document provides the details of Northern Gas Networks review of the SLM.

The outcome of this consultation will be submitted to the Authority on 31 December 2013

## Purpose of Document:

This document represents the fulfilment of Northern Gas Networks Licence obligation to consult on the outcome of its review of the SLM and gives interested parties the opportunity to review and comment on the details of the review.

## Summary

Northern Gas Networks has an obligation under Special Condition 1F Part E of its Licence to review the Shrinkage and Leakage Model (SLM) on an annual basis and to consult on the outcome of that review with other DN Operators, gas shippers and other interested parties.

The purpose of this review, 'the SLM Review', is to assess how the SLM can better achieve the objectives of the set in in paragraph 1F.13 of the Licence, "The Shrinkage and Leakage Model must be designed to facilitate the accurate calculation and reporting of gas Shrinkage and gas Leakage in or from each Distribution Network operated by the Licensee."

The outcome of Northern Gas Networks 2013/14 SLM Review is:

- Northern Gas Network's, in conjunction with the other GDNs, has initiated a change to the modelling of low pressure services, which has been consulted upon and is awaiting approval for implementation from Ofgem.
- Northern Gas Network's has been in regular consultation with other DN's at the Shrinkage Forum regarding the possibility of a modification in respect of AGI Venting.
- Northern Gas Network's has been in regular consultation with other DN's at the Shrinkage Forum regarding the possibility of a modification in respect of Interference Damages.
- Northern Gas Networks is working with Ofgem and the industry with the aim of addressing particular areas of theft, which may result in changes to the shrinkage regime and ultimately may require a change to the SLM.
- Northern Gas Network's has not identified any other areas of the SLM that could be improved, in a cost effective way, such that it better achieves the SLM objective of "facilitating the accurate calculation and reporting of gas shrinkage and gas leakage" as specified in Special Condition 1F.13. However, we will continue to review these areas and technology developments that may facilitate improvement.

## 1. Introduction

### 1.1 Background

Northern Gas Networks has an obligation under Special Condition 1F Part E of its Licence to review the Shrinkage and Leakage Model (SLM) on an annual basis and to consult on the outcome of that review with other DN Operators, gas shippers and other interested parties.

The purpose of this review, 'the SLM Review', is to assess how the SLM can better achieve the objectives of the set in in paragraph 1F.13 of the Licence, "The Shrinkage and Leakage Model must be designed to facilitate the accurate calculation and reporting of gas Shrinkage and gas Leakage in or from each Distribution Network operated by the Licensee."

### 1.2 Responding to this consultation

We would welcome comments on all aspects raised within this consultation document, although specific questions have been identified within section [5](#) of this document.

Responses to this document should be received no later than 27th December 2013 and may be provided via the Joint Office or email to: [g mills@northerngas.co.uk](mailto:g mills@northerngas.co.uk)

## 2. Components of the Shrinkage and Leakage Model

The shrinkage output from the Shrinkage and Leakage Model is comprised of three elements:

- Leakage Model (95%)
- Theft of Gas (3%)
- Own Use Gas (2%)

These are reviewed in detail below.

### 2.1 Leakage Model Components

#### 2.1.1 Low Pressure (LP) mains leakage (61% of leakage)

Leakage from low pressure mains is estimated by applying the leakage rates determined from the National Leakage Test (NLT) programme carried out in 2002/03 to the mains asset records. The 2002/03 NLT, which was a repeat of an earlier testing programme carried out in 1991/92, applied the 'pressure-decay' method of measuring leakage from mains. The 'pressure-decay' method is recognised as being one of the most accurate methods available for the purposes of determining leakage from gas distribution systems; however, the associated cost is usually considered prohibitive<sup>1</sup>.

In order to improve the estimation of LP mains leakage, it would be necessary to repeat the testing procedure and we do not believe that there would be sufficient value in this.

#### 2.1.2 Low Pressure Service Calculation (16% of leakage)

As with low pressure mains, leakage from low pressure services is estimated using the leakage rates determined from the 2002/03 NLT, which provided an average leakage rate for each of four service categories<sup>2</sup>.

<sup>1</sup> The 2002/03 tests cost in the order of £10m to complete and it would cost significantly more to repeat the tests now.

<sup>2</sup> Steel and PE service connections to PE or Metallic mains. However, the 2002/03 NLT determined a zero leakage rate for connections to PE mains.

## NORTHERN GAS NETWORKS SLM REVIEW 2013/14

This element of the leakage model has been subject to two modification proposals, one of which was implemented in 2009 and the other has been consulted upon and is awaiting Ofgem approval.

Historic records of service populations are not as comprehensive as those of mains and, accordingly, it is necessary to estimate these. Until 2008/09, the leakage model did not have the facility to update service populations. In 2008/09 the model was modified to enable the impact of service replacement to be reflected in the modelling assumptions; however, this did not correct for the service replacement that had gone unaccounted for from when the model was originally established (early 1990's). Subsequent to the earlier model change, a further modification has been proposed and consulted upon that seeks to address the issue of unaccounted for historic service replacement; this change is awaiting Ofgem approval for implementation.

It is not expected that there will be any further development of the leakage model in respect of low pressure services in the near term.

### 2.1.3 Medium Pressure (MP) Leakage (7% of leakage)

MP Leakage is estimated by applying the LP leakage rates at 30mbar to the MP mains asset profile. The rationale for this is that the number of public reported escapes (PREs) per km of MP main is of a similar order to that of the LP system and, hence, it is inferred that the mains must be leaking at a similar rate<sup>3</sup>; the LP system typically operates at an average system pressure of around 30mbar. In addition, studies have shown that gas supply systems tend to leak at similar rates per km of pipe; this may be because there is a maximum leakage concentration that would go unreported.

Clearly, it would be better to have a pressure related calculation of leakage from the MP system, which would facilitate a more accurate calculation and provide a mechanism for achieving and reflecting leakage reduction. To achieve this, it would be necessary to establish MP specific leakage rates.

The best method of achieving an improved MP calculation would be to carry out a testing programme similar to that carried out for the LP system. However, testing the MP system would be very difficult and expensive due to the difficulties of isolating the mains and testing at higher pressures.

An alternative methodology that is used elsewhere in the world is to monitor the increase in flow associated with a deliberate increase in pressure at a period of low, and assumed stable, demand with any increase in flow being deemed due to pressure related leakage. However, this methodology may be difficult to achieve with the complex MP systems in the UK.

Neither of these potential methodology changes is considered to be cost effective at present; however, as this is a significant source of leakage it is an area we would be looking to explore in greater detail in the near future.

### 2.1.4 AGI Leakage (10% of leakage)

The leakage from AGIs was determined via a national testing programme in 2002/03, which established average leakage rates for five types of AGI. The most likely improvement to the AGI leakage calculation would be to carry out another leakage survey on them. This would be quite expensive (the last survey cost in the order of £1m) and so is not considered cost effective at present. However, new technology for identifying and measuring leakage is being developed, which could potentially be used to achieve a cheaper surveying methodology in the future.

<sup>3</sup> If the LP rates were to be applied at actual MP system pressures, the amount of leakage calculated would be in the order of 30-40 times higher, which, if this were actually the case there would be far more PREs/km on the MP system.

## 2.1.5 AGI Venting (5% of leakage)

The current estimate of AGI Venting is based on a national figure quoted in a Watt Committee report from 1994. The derivation of this value is unknown and as it is a single fixed value for each LDZ, it remains unchanged.

Northern Gas Networks has consulted with other DN's at the Shrinkage Forum and National Grid have initiated a project to review venting rates of the most common pieces of equipment used pneumatic control of AGIs, with the intention of improving the AGI venting estimation by making it an activity based calculation. It is expected that a revision to the AGI Venting calculation, based on the outcome of the study, will be subject to a formal consultation later in this formula year.

## 2.1.6 Interference Damage (0.4% of leakage)

There are two parts to the Interference Damage leakage calculation. One part is based on an assumed leakage rate per incident multiplied by an average response and repair time and the other is based on specific assessment of large incidents (>500kg of gas released). Although it would probably be feasible to update the time element and perhaps reassess average leakage rates, given that this is such a small amount of the overall leakage estimate, the time, effort and cost of doing so is not considered to be worthwhile.

The issue of the Interference Damage calculation and, in particular, its impact in respect of the shrinkage and environmental emissions incentives was raised with Ofgem during the RIIO-GD1 price control review. Although it is recognised that the GDNs can, perhaps, influence the number incidents occurring via engagement with relevant industry bodies, advertising campaigns and robust internal processes, the magnitude of any one incident is out of the GDNs control. Ofgem referred to this issue in the Final Proposals<sup>4</sup>:

"2.26. We recognise that revenues under the rolling incentive will be strongly influenced by companies' performance in the last year of RIIO-GD1. This performance could be influenced by factors outside GDNs control such as third party damage to gas mains. To mitigate for this, we welcome modifications to the shrinkage model (used by GDNs to calculate and report shrinkage and leakage) which addresses this issue whilst continuing to place the right incentives on companies to manage shrinkage and leakage."

## 2.2 Theft of Gas (0.02% of Shrinkage)

Shrinkage includes an element of theft deemed 'transporter responsible'. This is currently estimated by applying a fixed 0.02% factor to throughput; the absolute level of theft, by its nature, is impossible to establish.

However, Northern Gas Networks are engaging with Ofgem and other industry parties to establish a way of addressing certain elements of theft, namely gas offtaken at 'unregistered' and 'shipperless' sites. There is a considerable amount of industry activity in this area and NGN believe that appropriate recovery could be made through changes to SLC7 of the licence or, could involve expanding the shrinkage theft of gas definition and associated incentive. The full scope of this work and its potential impact on the determination of shrinkage are yet to be established.

## 2.3 Own Use Gas (0.0113% of Shrinkage)

OUG refers to gas used by the transporter for operational purposes, primarily pre-heating, but which does not pass through a meter. This is currently estimated by applying a fixed 0.0113% factor to throughput, which was established by a study carried out in 2002. There has been very little change to Northern Gas Networks pre-heating equipment since the original study was carried out and, therefore, it is unlikely that the amount of pre-heating will have changed significantly.

<https://www.ofgem.gov.uk/ofgem-publications/48155/2riiogd1fpoutputsincentsdec12.pdf><sup>4</sup>

## NORTHERN GAS NETWORKS SLM REVIEW 2013/14

In the past, consideration has been given to metering OUG; however, Northern Gas Networks believes that the cost associated with meter installation and on-going meter reading and maintenance would outweigh the financial benefits of an improved estimation.

### 3. Smart metering

In accordance with Part G of Special Licence Condition 1F of the GT Licence, Northern Gas Networks, in conjunction with the other DNs, will be assessing the relevance of the smart meter roll-out programme, and associated data, to the shrinkage and leakage estimation process. The initial report on this is to be delivered by 31 July 2014. To this end, we will be approaching shippers/suppliers for information to support the report to the Authority.

### 4. Outcome of SLM Review

- Northern Gas Network's, in conjunction with the other GDNs, has initiated a change to the modelling of low pressure services, which has been consulted upon and is awaiting approval for implementation from Ofgem.
- Northern Gas Network's has been in regular consultation with other DN's at the Shrinkage Forum regarding the possibility of a modification in respect of AGI Venting.
- Northern Gas Network's has been in regular consultation with other DN's at the Shrinkage Forum regarding the possibility of a modification in respect of Interference Damages.
- Northern Gas Networks is working with Ofgem and the industry with the aim of addressing particular areas of theft, which may result in changes to the shrinkage regime and ultimately may require a change to the SLM.
- Northern Gas Network's has not identified any other areas of the SLM that could be improved, in a cost effective way, such that it better achieves the SLM objective of "facilitating the accurate calculation and reporting of gas shrinkage and gas leakage" as specified in Special Condition 1F.13. However, we will continue to review these areas and technology developments that may facilitate improvement.
- An initial assessment on the relevance of smart metering to the shrinkage and leakage estimation process is to be delivered by 31 July 2014.

### 5. Consultation Responses

Respondents' views are sought on all issues set out within this consultation but in particular on the following:

1. the areas of the SLM that Northern Gas Networks has identified for development within this consultation;
2. any other areas of the Shrinkage and Leakage Model that can be cost effectively developed to improve the accuracy of the assessment; and
3. the potential availability of smart metering data that can be used to facilitate or improve the shrinkage and leakage estimation process.