GL Noble Denton

Report Number: 11170	4th May 2011
Allocation of Unidentified Gas Statement	
Not Restricted	GL Noble Denton

Prepared for:

Uniform Network Code Committee

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1.0	Tony Perchard, Clive Whitehand	Jo Kingdon	04/05/2011

Previous issues of this document shall be destroyed or marked SUPERSEDED

Executive Summary

This first draft Allocation of Unidentified Gas Statement (AUGS) is submitted for review and comment by the Gas Transporters and Shippers as part of the process to develop a methodology to calculate and correctly apportion Unidentified Gas (UG).

The document describes how the Allocation of Unidentified Gas Expert (AUGE) has followed the AUGE guidelines to date. This draft AUGS provides a high level description of the methodology proposed by the AUGE and the data sets requested and received to date.

For each area of UG under consideration, the AUGE has outlined the approach to deriving a methodology to calculate the split of UG between Larger Supply Point (LSP) and Smaller Supply Point (SSP) markets. The analysis and development of the detailed methods will continue as data becomes available and these will be expanded for the second draft AUGS due in July 2011. The AUGE welcomes comments on the proposed methodologies so that these may be considered during the analysis phase.

There are certain topics that the AUGE has considered not to contribute to UG. These are Shrinkage Error and Metering Error. The rationale for these to be excluded from UG is described within the statement for review during the first consultation period.

Contents

1 Introduction

1.1 Background

The UK gas industry can be segmented into two market sectors; Larger Supply Points (often referred to as Industrial and Commercial consumers, LSP) and Smaller Supply Points (often referred to as Domestic Consumers, SSP). These sectors are defined by the Annual Quantity (AQ) of gas offtaken from the system in a year. Larger Supply Points have an AQ of 73,201kWh and above, Smaller Supply Points have an AQ of up to 73,200kWh. Many processes within the gas industry differ between these two sectors.

The majority of gas consumed in the UK is metered and registered. However, some gas is lost from the system, or not registered, due to theft, leakage from gas pipes, consumption by unregistered supply points and other reasons. Of the gas that is not directly consumed/measured some can be, and is modelled and some is not. The gas that is lost and not recorded is referred to as Unidentified Gas (UG).

There is currently nothing in place to determine the Allocation of Unidentified Gas between the LSP and SSP market sectors; it is currently all allocated to the SSP market sector. Through the approval of Modification 229 – Mechanism for correct apportionment of unidentified gas[7] provided by an Allocation of Unidentified Gas Expert (AUGE), OFGEM has instructed that this must change and a methodology needs to be defined to ensure that Unidentified Gas can be measured and charged equitably to the relevant gas sectors.

Under the current Uniform Network Code (UNC) charges are made to Shippers for the volume of gas transported (commodity and energy charges). For LSPs the actual value charged is determined by the volume of gas transported as measured by the metering equipment. For SSPs, the commodity charge is derived by calculating the difference between the volumes of gas measured coming in to the network less the volume of gas measured by the LSPs. Each Shipper with an SSP portfolio is charged a proportion of the total SSP market in proportion to their Annual Quantity (AQ) value against the total SSP market AQ.

As a result of this approach, by default all Unidentified Gas “lost” from the system is charged to the SSP market. This issue has been under consideration for some time and it is generally agreed that Unidentified Gas is also lost from the LSPs, and this Unidentified Gas should be included in the gas volume charged to Shippers with LSPs in their portfolio in addition to those with SSPs.

There have been several UNC modification proposals intended to resolve this issue (Mod 194[3], 194a[4], 228[5], 228a[5]), none of which have been accepted by the industry. A further modification, Mod 229[7] provides for the appointment of an expert (the Allocation of Unidentified Gas Expert or AUGE) with responsibilities for determining of the value of Unidentified Gas so that relevant quantities can be allocated to the correct market sectors.

GL Noble Denton has been appointed to the role of AUGE with the aim of developing a methodology to apportion UG fairly across both the LSP and SSP market sectors.

1.2 High Level Objectives

The AUGE's high level objectives are:

- To determine data required from industry bodies to evaluate Unidentified Gas
- To develop a methodology of calculating Unidentified Gas
- To publish the methodology in the AUGS (this document)
- To consult with the industry bodies and respond to questions / issues raised
- To prepare an AUG table containing Unidentified Gas volumes and rates

1.3 Scope

This document will contain the following:

- High level overview of the methodology and approach to its development
- Summary of data requested, received and used, and associated assumptions
- Detailed description of the methodology for each part of the Unidentified Gas calculation
- Questions raised by the industry bodies during consultations and responses as appropriate
- The AUGS Table will be provided in a separate document (TBC)

1.4 Out of Scope

The AUGS is not concerned with issues with the deeming algorithm or the RbD mechanism.

1.5 Document status

This section provides a status summary of this document at each stage of the review process as it is expected that some data may not be available at the time of the initial draft.

Unidentified Gas Subject	Data Status	Methodology Status	AUGS Status
Unregistered Sites	Requested	Under development	Proposed approach drafted
Shipperless Sites	Requested	Under development	Proposed approach drafted
IGT CSEPs	Requested	Pending data	Pending
Corrections to Shrinkage Error	N/A	Complete	Ready for review
Shipper Responsible Theft	Data Received 18th April	Under development	Proposed approach drafted
Metering errors	N/A	Complete	Ready for review

2 Compliance to Generic Terms of Reference

This section describes how GL Noble Denton has adhered to the Generic Terms of Reference described in section 5 of the AUGE Guidelines [1].

The AUGE will create the AUGS by developing appropriate, detailed methodologies and collecting necessary data.

The AUGE has reviewed previous proposed modifications regarding Unidentified Gas to avoid duplication and to gain understanding of the core issues before devising a methodology. Data required to underpin the analysis has been requested and will be used to develop the methodology. In this draft the AUGE sets out the approach to the methodology and, where appropriate, details of the methodology. Following the first consultation period the methodology will be developed further and in more detail as more data is provided.

The decision as to the most appropriate methodologies and data will rest solely with the AUGE taking account of any issues raised during the development and compilation of the AUGS.

The proposed methodology and assessment of what constitutes Unidentified Gas in this draft has been decided by the AUGE without influence from any other party.

The AUGE will determine what data is required from Code Parties in order to ensure appropriate data supports the evaluation of Unidentified Gas.

The AUGE has examined data used from previous modifications and requested further and more up to date data pertaining to theft, shipperless and unregistered sites, unknown MPRNS and any information the Shippers may have pertaining to theft in addition to that recorded by Xoserve.

The AUGE will determine what data is available from parties in order to ensure appropriate data supports the evaluation of Unidentified Gas.

The AUGE has determined data available following discussions with Xoserve, as much of the data required for this analysis is held by Xoserve. In addition the AUGE has requested information on any additional data that may be relevant to this study from the Shippers.

The AUGE will determine what relevant questions should be submitted to Code Parties in order to ensure appropriate methodologies and data are used in the evaluation of unidentified error.

The AUGE has raised additional questions to the Code Parties (see section 5.6)

The AUGE will use the latest data available where appropriate.

Recent theft and shipperless/unregistered sites have been requested. Further updates of data will be requested as the methodology develops.

Where multiple data sources exist, the AUGE will evaluate the data to obtain the most statistically sound solution, will document the alternative options and provide an explanation for its decision.

This guideline has not needed to be applied at this stage.

Where data is open to interpretation, the AUGE will evaluate the most appropriate methodology and provide an explanation for the use of this methodology.

This guideline has not needed to be applied at this stage.

Where the AUGE considers using data collected or derived through the use of sampling techniques, then the AUGE will consider the most appropriate sampling technique and/or the viability of the sampling technique used.

This guideline has not needed to be applied at this stage.

The AUGE will present the AUGS in draft form (the "Draft AUGS"), to Code Parties seeking views and will review all the issues identified submitted in response.

The AUGE has submitted this document the "Draft AUGS" to the Code Parties seeking initial views/review. The first draft outlines the overall proposed methodology and details of the methodology proposed for each item of UG based on data received and investigations to date. The second draft due in July is expected to have the remaining areas developed to completion and include feedback from the first consultation period.

The AUGE will consider any query raised by a Code Party with regard to the AUGS or the data derived, and will respond promptly with an explanation on the methodology used.

This guideline has not needed to be applied at this stage.

The AUGE will consider any relevant query that was raised during the creation of the previous AUGS and was identified as requiring a change to the AUGS, but was not incorporated into the immediately previous AUGS.

This guideline has not needed to be applied at this stage.

The AUGE will provide the Draft and Final AUGS to the Gas Transporters for publication.

This draft is provided to the GTs for publication on 3rd May 2011.

The AUGE's final determination shall be binding on Shippers except in the event of fraud, material breach, or where The Committee unanimously considers it is so clearly erroneous for it to be applicable.

This guideline has not needed to be applied at this stage.

The AUGE will undertake to ensure that all data that is provided to it by all parties will not be passed on to any other organisation or used for any purpose other than the creation of the methodology and the AUGS.

Data provided by Xoserve is done so via the UK-Link secure website and is available to all relevant code parties (with the exception of any data concerning market share or personal data). On receipt of data, the AUGE has stored the data on our secure project storage area with limited access by the consultants working on the project. The AUGE can confirm data used in the analysis will not and has not been passed on to any other organisation.

The AUGE shall ensure that all data provided by Code Parties will be held confidentially, and where any data, as provided or derived from that provided, is published then it shall be in a form where the source of the information cannot be reasonably ascertained.

Data is stored on our secure project storage area and access limited to those working on the project. Any data that contains market share or code party specific information will be and has been made anonymous to ensure the source of the information cannot be ascertained.

3 Summary of Previous Analyses

This section summarises previous analyses and proposals for the Allocation of Unidentified Gas. This is not intended to repeat previous findings but recognise that a lot of work has been carried out previously to solve this problem.

Methodologies to apportion Unidentified Gas to the LSP/SSP markets have been proposed in a number of network code modifications, notably Mods 194, 194A, 228 and 228A. In addition Mods 115 and 115A sought to correctly apportion NDM error.

Mod 194 proposed an RbD Allocation table which would apportion a percentage of Unidentified Gas to the SSP and Non-Daily Metered (NDM) LSP and Daily Metered (DM) LSP sectors.

Mod 194A was based on 194 and proposed assigning a fixed volume of Unidentified Gas to the NDM LSP and DM LSP sectors.

In both cases, neither proposal populated the tables, with the intention that this would be done via future modification amendments.

Mod 228 proposed to populate the RbD Allocation table proposed in Mod 194 with a percentage of Unidentified Gas allocated to each market sector and a methodology to derive these values.

Mod 228A was based on Mod 228 and proposed fixed values instead of percentages, again with a methodology to derive these values.

None of the above modifications were approved and the rationale for this is documented in OFGEMs decision letter of 26th May 2010 [14].

In 2004 OFGEM carried out a study on theft in the UK Gas and Electricity Industry [18] followed up by a next steps document in April 2005 [8]. This showed quite a lot of variation year on year for alleged and proven theft cases. It was also noted that increases in allegations were partly attributed to increased detection activity by the Shippers. One common theme was lack of information of the levels of unknown theft and estimates on this vary significantly.

The 228/228A modification report [5] considered three options to calculate theft apportionment and proposed the third option,

- Based on AQ proportions
- Corrected Percentage of 'valid' theft energy
- Simple average between allegations and detected theft

However, it also attributed residual RbD error as being theft. The TPA Solutions report on Mod 228/228A [6] concluded that the hypothesis that reconciliation quantities comprise theft as proposed by Mod 228 did not stand up to scrutiny.

There have been several network code modifications considering theft, Mod 274 [10] proposed an independent agent to determine strategies to improve investigation/detection and prevention and this is ongoing. Mods 231, 277, 346 aimed to improve / consider issues with regard to incentives for detection of theft.

Based on the information and methods proposed to date the AUGE believes that there are issues with the estimation of theft and previous methods proposed do have fundamental issues. These will be given further consideration in the detailed methodology sections of the AUGS as more data is provided.

4 High Level Overview of Methodology

This section provides a high level overview of the methodology. For each of the areas of UG presented here a more detailed discussion of each and subsequent methodology (as appropriate) is introduced in section 6.

4.1 LDZ Load Components

Daily load (as measured or calculated at the Supply Meter Point) falls into thee relevant categories as far as the reconciliation process is concerned. These are:

Daily Metered (DM) Load

This is by definition metered and known on an ongoing daily basis.

Larger Supply Point Non Daily Metered (LSP NDM) Load

The deemed load is first calculated using the allocation algorithm on a daily basis. It is then corrected when genuine meter reads become available, with reciprocal corrections being made to the Smaller Supply Point load via Reconciliation by Difference (RbD). At present, the effect of RbD is usually to reduce LSP NDM load. This is evidenced by the fact that across the three calendar years from 2008 to 2010, 79% of RbD values were positive, and the average monthly reconciliation quantity (including both positive and negative values) was 44.2 GWh. The reasons for this are described later.

Smaller Supply Point (SSP) Load

This is calculated using the same allocation process used for LSP NDM load on a daily basis. When actual LSP NDM readings become available, this is subject to RbD, the effect of which is usually to increase the SSP load as described above,

The sum of these three load components does not equal the gas intake into the LDZ due to the presence of two further factors, as follows:

Shrinkage

LDZ Shrinkage occurs between the LDZ offtake and the end consumer (but not at the Supply Meter Point - the LDZ shrinkage zone stops immediately before this point). It covers:

- Leakage (from pipelines, services, AGIs and interference damage)
- Own Use Gas
- Transporter-responsible theft

The majority of shrinkage is due to leakage, and the overall LDZ shrinkage quantity is calculated using the standard method defined in the Unified Network Code (UNC).

Unidentified Gas

Unidentified Gas occurs downstream of Shrinkage, i.e. at the Supply Meter Point. It potentially covers:

- Unregistered sites
- Independent Gas Transporter measurement errors
- Corrections to the Shrinkage estimate
- Shipper-responsible theft

Unidentified Gas is currently unknown and hence must be estimated.

In addition to the above factors, there may also be a small element of Stock Change, which represents the difference between opening and closing stock on any given gas day. Given that aggregate Unidentified Gas is based on annual rather than daily consumptions, any adjustment due to stock change (which in this case would be the difference in stock between the start of the UG year and the end of the UG year) will be negligible. It has therefore been discounted from calculations.

4.2 Location of Unidentified Gas in the RbD Process

The AUGE believes that the fundamental basis of this analysis lies in developing a detailed and accurate breakdown of where Unidentified Gas lies at each stage of the calculation and reconciliation process. UNC modification proposals 194, 194A, 228 and 228A went some way towards achieving this goal, but each is based on an incomplete understanding of where Unidentified Gas lies and hence none of these proposals provided a satisfactory solution.

It is therefore important to understand where Unidentified Gas is present at each stage of the calculation in order to quantify it accurately. Under the current reconciliation process, Unidentified Gas is fragmented until after RbD is applied. At this stage it is collected into a single quantity, but exists only as an aggregate with SSP load, where the breakdown of the two is unknown. The quantity of Unidentified Gas can therefore be estimated in one of two ways:

- Calculated directly
- Based on an estimated value for SSP load and calculated by difference

The process of calculating Unidentified Gas begins with the allocation algorithms defined in Section H of the Uniform Network Code, "Demand Estimation and Demand Forecasting" [15]. Whilst LDZ input and DM load are recorded and known on a daily basis, LSP NDM and SSP loads are not, and hence are estimated using the allocation algorithms. These algorithms are based on End User Categories (EUCs), with total NDM load split across a number of EUCs defined by load band and consumption pattern.

Initial allocation is carried out separately for each EUC. SSP load falls within a single EUC (XX:EYY01B, where XX is the LDZ code and YY the year). This EUC covers all loads up to 73,200kWh per annum. The remaining NDM load, which together makes up the LSP NDM category, covers EUCs XX:EYY02B to XX:EYY09B. Each of the bands 03 to 08 are further split into four "Winter:Annual Ratio" categories which are each modelled separately, leading to a total of 33 EUCs per LDZ. The allocation algorithms are trained on data from at least 3900 smaller supply points and 15,000 larger supply points across all EUCs, which have been selected and logged for this purpose.

The initial algorithm results therefore estimate actual load only (i.e. with no Unidentified Gas component) as they are trained on actual recorded load values. They will, however, necessarily include model error as a result of AQ inaccuracy and the natural variability of the statistical modelling process. They do, however, represent the best estimate of EUC loads without Unidentified Gas as this point.

The sum of these estimates is then reconciled against the metered total LDZ load (once adjusted for shrinkage and with known DM load removed). This is achieved by applying a multiplicative factor to the allocation estimates to ensure that they sum to the right total. Given that the total LDZ load includes Unidentified Gas, the final allocation quantities therefore contain the following elements:

- Actual EUC load.
- Model error. This can be either positive or negative, but it is likely to be positive because, as the TPA Solutions assessment of Mod 228/228A [6] highlighted, both SSP and LSP NDM AQs tend to be over-estimates. The TPA analysis showed that across the four formula years from 2005/06 to 2008/09, AQs for the SSP sector exceeded weather corrected demands by an average of 1.8%, whilst the for LSP sector, AQs exceeded weather corrected demands by an average of 8.9%.
- Unidentified Gas. This is always positive.

The nature of the calculation means that the Unidentified Gas component is split across EUCs by volume ratio, which is unlikely to represent a realistic breakdown of where it arises. In addition, whilst the components of each EUC load estimate are known (as listed above), the split between them is not.

At this stage, data is aggregated into the standard two categories: SSP load comes from EUC XX:EYY01B, whilst LSP NDM load is the aggregate of the remainder of the EUCs.

The RbD step that occurs after the meter readings for the LSP NDM sector have been made moves all Unidentified Gas to the SSP sector and at the same time eliminates model error (as actual loads are now known). In practice, LSP NDM load is usually reduced during this step as discussed in Section 4.1 above, for two reasons:

- Unidentified Gas is removed, which is always positive.
- The figures from the TPA analysis[6] quoted above show that whilst the AQ values for all EUCs tend to be over-estimates, the level of overestimation is greater for LSP NDM loads than for SSP loads. The allocation calculations therefore skew the load estimate towards the LSP NDM section, and this imbalance is redressed via the RbD calculations.

The RbD process and the movement of Unidentified Gas and model error throughout it are shown in Figure 1:

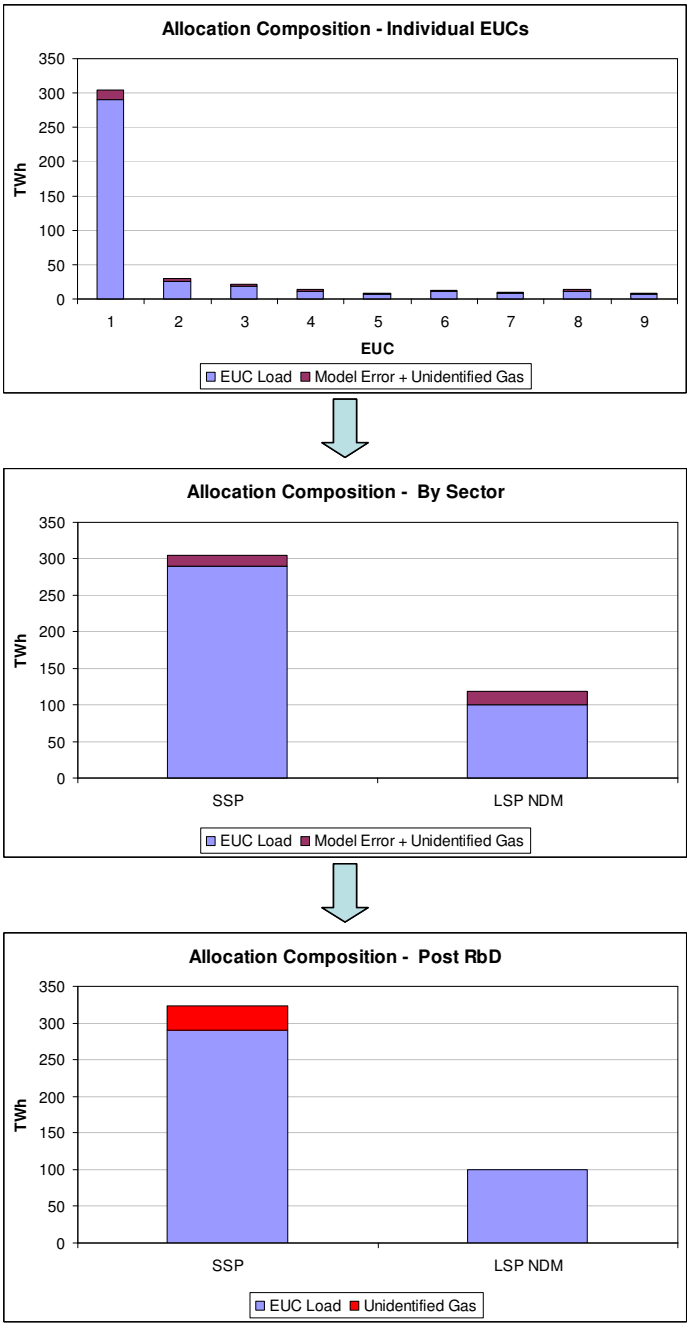

Figure 1 – Location of Unidentified Gas

It is important to note that the RbD quantity, whilst containing an element of Unidentified Gas, is largely composed of model error. The AUGE believe that the assumption that the RbD value is composed largely of Unidentified Gas (as was put forward in modifications 228 and 228A) is not valid. The element of RbD that consists of model error should remain in the SSP market sector where it is under the current methodology.

The proposed methodology is based on Unidentified Gas calculations carried out on post-RbD data. It is at this stage that all the elements of Unidentified Gas are joined together for the first time, as identified in the third stage of Figure 1. The split between actual SSP load and Unidentified Gas is still unknown, however, and so an algorithm is required to estimate this.

4.3 Unidentified Gas Methodology

The AUGE proposes to estimate Unidentified Gas directly as follows:

It is known that data for the four potential components of Unidentified Gas (unregistered sites, IGT errors, shrinkage error and shipper-responsible theft) is available, and this allows each to be estimated. Provision of the requested data will allow a robust estimate of each to be made, with the Unidentified Gas total being the sum of the four categories. The data requested will also allow the split of Unidentified Gas between the LSP and SSP sectors to be calculated on a sound statistical basis. The precise statistical techniques used to create these estimates will be based on the format and availability of data, and the selection of the most appropriate method forms part of the overall analysis. The detailed analysis is provided in Section 6 of the AUGS.

a) Unregistered Sites

The AUGE believe these sites should be included in the Unidentified Gas calculations. The data required for this element consists of the historic number and AQ of sites either late registered or unregistered, split by market sector. Total Unidentified Gas from this source and the split between market sectors will then be calculated by assigning standard consumption profiles to the validated AQ values from these sites.

b) IGT Connected System Exit Point (CSEP) Setup and Registration Delays

IGT CSEP setup and registration delays should also be included in the Unidentified Gas calculation. Historic figures from IGTs and the split of IGT supplied sites by AQ across the market sectors will be used to calculate and split Unidentified Gas as appropriate from this source. The AQ is provided by the new site requesting party.

c) Shrinkage Error

Shrinkage errors affect the RbD calculation in that estimated shrinkage is used during the allocation process, and the final shrinkage figure may differ from this. The nature of the calculation means that this difference only affects the SSP load and the shrinkage account, however, and it can be either positive or negative. Therefore it is not Unidentified Gas but a separate issue that is dealt with by a different process. It should be noted that the amended shrinkage figure is only known at the end of the gas year, and hence any correction used before this point is based only on an anticipated shrinkage amendment – i.e. an estimate of the error. Whilst the shrinkage error is very small compared to the RbD volume, any estimate of

it would necessarily be subject to a large degree of uncertainty. Given that under the current process (as described in Section N of the UNC) the SSP sector and the shrinkage account are reconciled based on final shrinkage quantities calculated after year end, this element should not be considered part of Unidentified Gas.

d) Shipper-Responsible Theft

The AUGE propose this element should be included in the Unidentified Gas calculation. A certain amount of data for both detected and alleged theft exists, along with theft assumption figures used in the calculation of LDZ shrinkage (although the source data used as a basis for this assumption is unknown). Whilst the nature of theft means that actual figures are unknown, they can be estimated using this information and split across market sectors.

This calculation process will allow a reliable estimate of Unidentified Gas to be calculated based on the latest available data, which will in turn be used to populate the data table proposed in modification 194/194A. It also gives a sound basis for the year-on-year update of these figures, given appropriate provision of up-to-date information as requested.

4.4 Alternative method

An alternative method for estimating Unidentified Gas is to calculate a figure for the aggregate SSP load (not including UG) and then calculate UG by subtraction.

This approach requires more data, is more complex, and is subject to greater model uncertainty, and hence will only be considered as an alternative to the proposed methodology if the AUGE finds that the data for the direct calculation of Unidentified Gas is insufficient to complete the task. In order to estimate SSP load, demand data from the allocation algorithm and training sample would be required over and above the data specified in Section 5. Models for the estimation of SSP load would be trained on this data. These would produce different results to the deemed SSP load from the allocation algorithm, as this is scaled to reconcile correctly with LDZ load and hence contains Unidentified Gas. The new models would estimate SSP load only with no Unidentified Gas element. The SSP load estimate derived from these models would then be used to calculate the Unidentified Gas total by subtraction. This would then be split between the DM, LSP NDM and the SSP sectors as described above.

5 Data Used

This section describes the data requested, received and used to derive the methodology to calculate Unidentified Gas.

5.1 Summary

Data Requested	Status
Data sets used by TPA	Partially received
Theft Statistics	Initial data received
Shipperless/Unregistered Sites	Pending
IGT Errors	Pending
Questions to Shippers / additional theft information	Pending

5.2 Data from Previous Analyses

The following data has been requested

- An updated version of the dataset provided by Xoserve to enable the industry to carry out the analyses for Shrinkage, Unregistered/Shipperless Sites, IGT Errors and Theft that fed into UNC modification proposals 194/194A and 228/228A .

5.3 Theft

The following data concerning theft has been requested:

- A list containing records of each occurrence of alleged and confirmed theft, presented with each occurrence as an individual record. For each record, the following details should be included:
    - Date
    - LDZ
    - Shipper
    - Market sector (LSP band/SSP) based on current AQ value
    - Transporter or shipper responsible
    - Estimated volume (kWh) – where the theft allocation has been pursued

It is understood that reliable data is available from 2007.

5.4 Unregistered/Shipperless sites

The following information has been requested concerning Unregistered/Shipperless sites. In each case both the number of sites and their aggregate AQ was requested. In addition, all data, where possible, was split by Shipper and LDZ, and also between "Small AQ" and "Large AQ" categories.

Copies of the two-monthly reports on Unregistered/Shipperless sites were requested, going back historically as long as records are kept, covering the following categories:

- Shipper Activity
  This data should be split into sites believed to have a meter and those believed to have no meter.

- Orphaned
  This data should be split into sites believed to have a meter and those believed to have no meter.

- Shipperless sites PTS (Passed to Shipper)
  These are sites where a meter has been removed and 12 months after removal the network provider visits the site to remove or make the service secure and find a meter connected to the service. If it is the same meter as allegedly removed 12 months ago it is passed to the shipper concerned to resolve.

- Shipperless sites SSP (Shipper Specific rePort)
  Similar to Shipperless (Passed to Shipper) sites, these are sites where a site visit finds a new meter fitted, in which case it is reported to all Shippers.

- No Activity

- Legitimately Unregistered

- Created <12 months

In addition, the following information was requested:

- A summary of **all** sites that are unregistered, including those that have been unregistered for less than 12 months and ideally as snapshots

- A summary of **all** sites visited to have their service removed due to having been unregistered for more than 12 months, including those where the service was removed as planned. Data should be split between sites where the service was removed and those where gas was flowing and the service was not removed.

5.5 IGT CSEP Setup and Registration Delays

At the meeting held on 22nd March 2011, information was presented by Xoserve regarding the number of unrecognised projects (i.e. the number of CSEPs that exist in reality but are not present in Xoserve records). This data indicated that the number of unrecognised projects had dropped from around 3000 to around 1200 between 2009 and 2011. The following data was requested concerning such unrecognised projects:

- Unrecognised projects summary (we understand data is available from 2009)

- Composition of all registered CSEPs (AQ and number of sites by EUC).

It is recognised that only the IGTs will have information on the composition of unregistered CSEPs, although there is no requirement for an IGT to respond to a data request from the AUGE. Therefore it will be necessary to derive the average composition of known CSEPs and apply this to the number of unregistered ones.

5.6 Shipper Specific Questions

In addition to the data requests to Xoserve, the following questions were put to the Shippers:

1. What (if any) initiatives have you implemented to identify theft, and if so, when were they introduced? If these initiatives were only temporary, when did they stop?

   The aim of this question was not to name and shame Shippers but to understand if detection rates are proportionately higher for some Shippers than others, as this will aid the estimation of theft going forward. The requested theft statistics from Xoserve include shipper name so that the AUGE

can match theft levels with any initiatives implemented, but reporting will be in non-specific Shipper terms as per AUGE Guidelines.

2. Shippers are required to visit/inspect meters every 2 years. The AUGE requested statistics on the number of customers that have not been visited in the last 2 years by LSP/SSP group. This also required the total number of LSP/SSP customers currently prevailing and therefore any reporting will be in non-specific Shipper terms as per AUGE Guidelines.

3. Additional information on theft over and above data requested by the AUGE from Xoserve that the Shippers believe may be relevant to this subject was also requested.

4. It was suggested by shippers at the industry meeting held on 9th March 2011 that sites may exist, have a meter and take gas without being registered and without an MPRN. The Shippers were asked to provide any further data / evidence that they may have on the likely number of sites and AQ levels involved.

5.7 Industry Initiatives under Review

The following industry initiatives that may affect the calculation of Unidentified Gas in the future are currently under review:

Mod 369: Re-establishment of Supply Meter Points – Measures to Address Shipperless Sites

This Modification Proposal[2] seeks to modify the existing provisions of the Uniform Network Code regarding Reestablishment of Supply Meter Points to ensure Supply Point Registration where gas is consumed at a Supply Point which has been subject to Effective Supply Point Withdrawal but the original Supply Meter remains connected (or has been reconnected) and is capable of flowing gas. If adopted, this Mod would result in the removal of the "Shipperless Sites (Passed To Shipper)" category from the Unregistered/Shipperless element of the Unidentified Gas calculation. It does not apply to sites where a new meter has been installed and hence the remainder of the calculation would remain the same and as described in this document.

6 Methodology

This section describes the methodology in detail for each aspect of Unidentified Gas that will be included in the overall Unidentified Gas calculation.

6.1 Shrinkage Error

The AUGE believes that Shrinkage Error should not be included in Unidentified Gas calculations. The reasons for this are described below, where our understanding of LDZ shrinkage and how it applies to the RbD process is outlined. LDZ load is made up of the following elements:

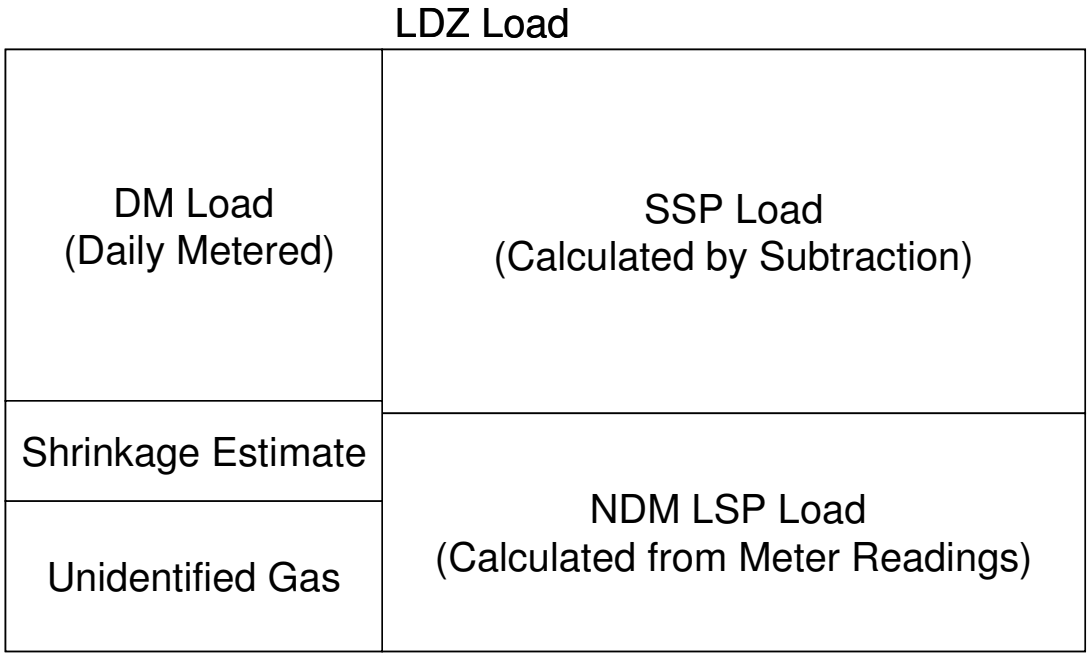

Figure 2 – Composition of LDZ Load

LDZ Shrinkage is comprised of:

- Leakage
- Own Use Gas
- Transporter-Responsible Theft

Each element is calculated as specified in the UNC on an LDZ by LDZ basis. The total Shrinkage value is then the sum of the components (see Figure 3). Calculations are carried out by the Gas Transporters (GTs) who own the LDZ in question (i.e. National Grid Distribution, Northern Gas Networks, Wales and West Utilities and Scotia Gas Networks).

Initial values for any given formula year ahead are calculated and submitted by each GT during the previous December (e.g. Dec 2010 for the formula year 2011/12). Final proposals are submitted during March. All of the elements of LDZ Shrinkage are throughput dependent, and so throughput values for the year ahead are estimated using recent years and/or seasonal normal demands. These final versions of the Shrinkage values go into the NDM demand allocation and RbD calculations.

Each Shrinkage element is estimated as follows:

- Leakage
  Distribution Mains and Service leakage is calculated using the results from the 2002/03 National Leakage Tests [16], along with forecast mains/service populations (based on planned replacement for the year ahead), average system pressure and average Monoethylene Glycol (MEG) levels for the network in question. Above Ground Installations (AGI) leakage figures derive from the findings of the 2003 Above Ground Installation Leakage Tests.

- Own Use Gas
  This element of shrinkage is estimated using the GL Noble Denton Own Use Gas model, which was developed in 2002 and verified through further research in 2006 [17]. This estimates that a national average of 0.0113% of throughput will be used as OUG, based on a pre-heater efficiency figure of 50%. This national average is applied to all networks.

- Transporter-Responsible Theft
  It is recognised that reliable data on the actual level of theft (as opposed to detected theft levels) is sparse. The current consensus is that 0.02% of LDZ throughput is lost to Transporter-Responsible theft, and this is the figure used in all Shrinkage calculations.

The purpose of including the category of "Shrinkage Errors" in the Unidentified Gas estimate (as proposed in Mods 194/194A and 228/228A) was to acknowledge the fact that the Shrinkage values supplied in advance of the formula year are only estimates and that the actual shrinkage that takes place during the year will not match the supplied figures. Therefore, some provision for accounting for this difference in the RbD calculation and/or Unidentified Gas calculation was sought.

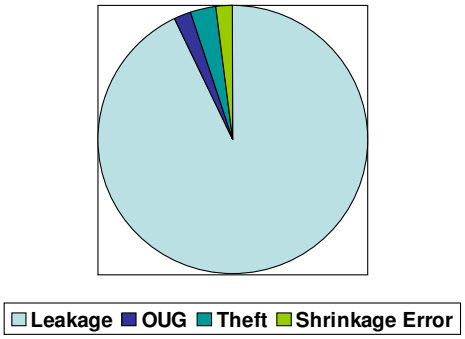

Figure 3 – Composition of Shrinkage

The effects of errors in the shrinkage estimate differ depending on whether the initial estimate is too high or too low:

- If the initial estimate is too low, actual Shrinkage is higher than the published estimate. This is an additional amount of Shrinkage gas which has actually been assigned to the SSP sector via RbD, but should actually have been charged to the Shrinkage Provider. The Shrinkage Provider is usually the GT for the network in question.
- If the initial estimate is too high, actual Shrinkage is lower than the published estimate. This represents the amount of gas which should be assigned to the SSP sector but has actually been charged to the Shrinkage Provider. Therefore this requires a credit to the Shrinkage Provider, with the difference charged to SSP.

It is important to note that these differences are not a part of Unidentified Gas, due to the fact that Unidentified Gas is a (positive) physical quantity of gas that has been used somewhere in an unrecorded manner. Corrections to the Shrinkage estimate can be positive or negative, and are in effect changes to the SSP sector and shrinkage account only. This is therefore a correction to RbD rather than Unidentified Gas. The necessary correction to RbD is already carried out as part of the GTs' post-year process.

After the end of any given formula year, the GTs once again calculate an estimate of Shrinkage for each of their LDZs, but with the basis of the calculations changed as follows:

- Actual throughput figures are used rather than estimated ones.
- Actual mains and service populations are used rather than those estimated from planned replacement.

The Shrinkage estimate is adjusted using these corrected values and adjustments made to both Energy Charges and Commodity (Transportation) Charges.

Each GT provides a statement after the end of the year containing the volume and financial adjustments, and it is assumed that these are applied to RbD as recommended in the documents. If this is the case then any Shrinkage errors are thus negated using the most accurate information available. Whilst this only happens some time after the event, it nevertheless ensures that RbD is adjusted for Shrinkage estimate errors.

The existence of this post-year process means that the only reasons for including Shrinkage Error in the Unidentified Gas calculation would be as follows:

1. If there was some reason to believe that the amended Shrinkage estimates were inaccurate:
   If this was believed to be the case, then the perceived inaccuracy could be included either in the Unidentified Gas estimate or as a correction to RbD. Each element of Shrinkage is already calculated using the most accurate information available, however, with estimates based on GL Noble Denton models for mains and service leakage, AGI leakage and OUG. Therefore, any corrections would be more likely to increase errors rather than decrease them. Should any opportunities to improve the estimates arise in the future, these would be best incorporated via a change to the current calculations rather than a post-processed error correction.

2. If there was a need for Shrinkage error to be included before the event rather than after the end of the formula year in question:
   This approach would bring its own problems, in that any estimate of the Shrinkage error made in advance would be subject to error itself. Hence a correction after the end of the year would still be required – in effect we would just be shifting from a "Correction to the Shrinkage Estimate" to a "Correction to the Corrected Shrinkage Estimate". This is self-defeating and hence should not be implemented.

Based on this analysis, it is therefore concluded that the current Shrinkage estimation system is fit for purpose and provides the most equitable solution available. Therefore no changes should be made to the RbD process in this area, and no consideration of Shrinkage error should be included in the Unidentified Gas calculation.

6.2 Unregistered and Shipperless Sites

The AUGE believes that both Unregistered and Shipperless sites should be included in the Unidentified Gas estimate. These types of gas arise from different sources and hence require different analyses in order to estimate accurately. Therefore Unidentified Gas sources in this area are grouped into elements that respond to similar drivers and each group is described separately below.

The AUGE has currently been supplied with data where Unregistered and Shipperless sites are split into seven categories, as follows:

- Shipper Activity
- Orphaned
- Shipperless Sites (Passed To Shipper)
- Shipperless Sites (Shipper Specific rePort)
- No Activity
- Legitimately Unregistered
- Created <12 Months

Each category is split between "Small AQ" and "Large AQ" (with the split threshold at the SSP/LSP level of 73.2MWhpa), and the number of sites in each category is recorded. It is understood that more detailed data is available, where each category is divided further into "believed to have meter"/"believed to have no meter" groupings, and both aggregate AQs and the number of sites recorded for each. This data has been requested, and in the sections below, it is assumed that this data will be made available to the AUGE.

6.2.1 Shipper Activity/Orphaned Sites

The total figure for Shipper Activity/Orphaned Sites covers all new sites that have an MPRN and appear in the Sites & Meters database but are not registered to a shipper. Only those that have a meter are capable of flowing gas, and so the first step is to obtain the number of sites and aggregate AQ data split into the "believed to have meter"/"believed to have no meter" groupings. As stated above, it is assumed that this data will be supplied to the AUGE by Xoserve.

There are a number of approaches that could then be used to estimate Unidentified Gas from this source:

1. Assume that all sites believed to have a meter are flowing gas. Use the aggregate AQ to estimate the amount of gas consumed in a year. All sites in this category are by definition more than 12 months old, so they can be assumed to have been taking gas for the entire year (and hence will have, on average, consumed a volume equivalent to their AQ).
2. The above analysis can be carried out at a more detailed two-monthly level, as the Unregistered and Shipperless Sites report is produced at this frequency. Therefore volumes can be calculated individually for each 2-month period and aggregated up to annual level.
3. The analysis can be made more accurate by acknowledging that not all new sites that are capable of flowing gas (i.e. those with a meter) will actually be doing so. An analysis should take place of the proportion of Shipper Activity/Orphaned Sites with meters that actually flow gas before they are registered with a shipper. This can be done by examining opening meter readings of all new sites. Those that have a non-zero opening read (or a meter read larger than a small threshold value to discount situations where the meter has recorded insignificant flows whilst not registered to a

shipper) can be viewed as having taken gas before being registered to a shipper. The proportion of sites where this has happened should be applied to the "believed to have a meter" category and the gas flow calculation carried out only on this subset. This analysis will require additional meter read data from Xoserve, over and above the current data request.

4. It is recognised that certain types of I&C consumers will not reach their full expected gas flow immediately but will instead build up to it over time. As all sites in the Shipper Activity/Orphaned category are by definition over a year old, this phenomenon will not affect this category. It will affect the similar "Created <12 Months" category, however, and therefore it will be discussed further there.

The approach described in number 3 above will be used to calculate UG for these sites if this data is available. If such data is not available, an estimate of the number of new sites with meters that are actually flowing gas will be made based on consultations with Xoserve and the shippers.

6.2.2 Shipperless Sites (Passed To Shipper and Shipper Specific rePort)

The figures for this category in the Unregistered and Shipperless Sites report represent those sites that have been shipperless for more than 12 months, and have been visited and found to still be flowing gas. Passed To Shipper sites are those where the old meter is still in place, and Shipper Specific rePort sites are those with a new meter. As the UNC currently stands there is no process of backbilling for either type of site, and so all gas consumed is Unidentified Gas. Mod 369 [2] will result in all Passed To Shipper sites being backbilled and hence these will no longer contribute to Unidentified Gas if this modification is adopted. Shipper Specific rePort sites will not be covered, however, and so will still contribute.

It is important to note that the sites recorded here do not represent all shipperless sites that are still flowing gas – just those that are older than 12 months and have been visited. A (potentially larger) number of sites will have been shipperless for less time but still be flowing Unidentified Gas. It is therefore important to obtain information for all shipperless sites, including those that have been shipperless for less than 12 months. This data should include both the number of sites and aggregate AQ and has been requested from Xoserve. Also required is the total number of shipperless sites visited, including those found to be flowing no gas which hence had their service removed as planned.

These data items can be used to calculate a "shipperless but still flowing gas" rate, which will then be applied to the supplied population of all non-new unregistered sites. The sites in the Unregistered and Shipperless Sites report can be regarded as having been taking gas for the full 12 months (and hence will have, on average, consumed their AQ value), whilst the remainder can be assumed to have been taking gas for an average of 6 months. Consumption estimates should therefore be amended to reflect this.

6.2.3 No Activity

Sites in this category are currently being processed and will end up in one of the other categories. These can be modelled as follows:

1. Disregard category as small.
2. Assume No Activity sites will end up in final categories in proportion with their size and amend other category figures as appropriate.
3. Request data from Xoserve on the breakdown of where No Activity sites end up and derive proportions. Amend other category figures as appropriate.

The AUGE will apply method 2 to the No Activity sites when calculating UG.

6.2.4 Legitimately Unregistered

These sites are believed to have no meter, and hence are not capable of flowing gas. Therefore this category does not contribute to Unidentified Gas.

6.2.5 Sites Created < 12 months

These sites may still be flowing gas and hence contributing to Unidentified Gas despite the fact that they will not be investigated until they have been unregistered for 12 months. Therefore they need to be included in calculations.

The proportion of such sites that have a meter and are assumed to be flowing gas can be taken from the data for Shipper Activity/Orphaned sites. The difference between the two categories is that as these sites are new (and assuming that the rate of new sites getting MPRNs and the rate of sites with MPRNs becoming registered are both steady), they will on average only have been taking gas for half of each time period under consideration. Therefore, given that the Unregistered and Shipperless Sites report is produced on a two-monthly basis, the subset of sites in this category that are taking gas can be assumed to have been doing so for one month.

In addition, the issue of certain types of I&C consumers not reaching their full expected gas flow immediately is relevant to new sites. In order to account for this effect, it will be necessary to model the average consumption over time for a variety of new LSP NDM sites. This would allow an average "new I&C meter" consumption profile to be created, which could then be used to amend the total flow figures calculated for the "Created <12 Months" category. This would require additional data from Xoserve over and above what has been requested so far, and will be implemented if such data is available.

6.3 IGT CSEPS

Connected System Exit Points (CSEPs) are typically small networks owned by Independent Gas Transporters (IGTs) that connect to the GTs' systems. They are often new housing estates, where the gas network for the estate has been built and is owned by an IGT. CSEPs can potentially contribute to Unidentified Gas where either loads within them or entire IGT networks are not recognised by the Xoserve system and are thus taking gas in an unrecorded manner.

Xoserve understands that it is not possible for a site to exist and be taking gas within a CSEP without it being registered on the relevant IGT system, and hence this area is ruled out as a source of Unidentified Gas. In addition, loads within CSEPs are included in the allocation algorithms in the same way as loads supplied by GTs, and so no errors arise in this way. AQ and consumption data for use in the allocation process is supplied by the IGT who owns the CSEP either in aggregate form (SSPs) or on a site-by-site basis (NDM LSPs).

Therefore, the only contribution that CSEPs make to Unidentified Gas is where an entire network is missing from the Xoserve system and therefore not taken into account during calculations. Xoserve hold regular meetings with IGTs and GTs in order to resolve such issues, and a regular report is made where the number of unknown IGT networks is recorded. As of early 2011, there were approximately 1200 unknown networks out of a total of around 32000, down from around 3000 in 2009.

It is recognised that only the IGTs will have records of the composition of these networks, and they are not required to respond to requests for data from the AUGE. It will therefore be necessary to derive average

CSEP composition from known IGT networks, and to apply this to the number of unregistered networks that are reported to exist. This approach will allow an estimate of both the total volume and the split between market sectors for unregistered IGT networks to be calculated.

New sites, particularly housing estates will be built to new building regulations with improved energy efficiency levels and therefore expected AQs may be lower than average consumptions. This will need to be allowed for in subsequent estimations of consumption.

Data has been requested to allow this analysis to take place.

6.4 Shipper Responsible Theft

Transporter-responsible theft (i.e. theft that takes place upstream of the Emergency Control Valve) is contained in the LDZ Shrinkage calculation and hence is not a part of Unidentified Gas.

Statistics for shipper-responsible theft (both alleged and proven) are held by Xoserve and have been requested by the AUGE. These consist of a database with one record per theft allegation, with a record of estimated kWh stolen and a flag for whether the theft was proven or not.

The problem with calculating theft levels is that the true level is unknown, with detected theft and alleged theft acting as lower and upper bounds respectively. There is anecdotal evidence that unknown theft is also significant and could result in theft as much as 10% of throughput. The AUGE has not seen any evidence to support this, however. Such levels would indicate that 1 in 10 of the population steal gas and given the large volumes and monetary values involved one would expect a much more concerted effort to detect and prevent theft (e.g. advertising campaigns to highlight the dangers of gas escapes if interfering with meters etc). Previous initiatives to assess theft and improve detection have been carried out. Mods 274 [10], 277 [11], 346 [12] and Theft of Gas “next steps” [8] provided detailed analysis of the situation and various information pertaining to theft. In particular there was little evidence and few propositions regarding unknown theft.

Shippers are obliged to inspect each meter at least every two years, and to report any incident of suspected theft to the GTs. These reports should, by definition, appear in the Xoserve theft dataset. Assuming that the inspections are carried out properly this should limit the level of unknown theft closer to the level of alleged theft and hence this is a suggested upper bound for theft.

Both detected and alleged theft statistics have the advantage of being known and recorded, but neither accurately reflects actual theft and will either under- or over-estimate the true value. Unfortunately, the location of the true theft value within the limits is unknown.

The most important part of the theft analysis is therefore to assess the likely position of true theft between the upper (alleged) and lower (detected) limits. There are a number of ways in which this could be done:

1. Assume true theft level at proven theft only. This will under-estimate true theft.
2. Assume true theft level at alleged theft value. This will over-estimate true theft.
3. Place true theft mid-way between proven theft and alleged theft. This approach may be more accurate but is arbitrary and may not be any closer to the truth than either extreme.
4. Attempt to establish a physical upper limit for theft based on known or estimated other variables (LDZ load, LDZ shrinkage, DM load, LSP NDM load, SSP load, and other sources of Unidentified Gas). This would require estimates of SSP load based on meter reads and it is unclear at this stage whether such estimates of aggregate SSP load exist. If SSP load is simply calculated by

subtraction (in the same way as in the RbD process), the split between metered and unmetered SSP load is unknown and it is not possible to quantify how much theft may have taken place. This approach may provide a physical upper limit, although there is a risk that this will lie above the alleged theft upper limit and hence be of no practical use.

5. Attempt to link changes in theft detection rates with shipper initiatives. Any increase in theft detections when shippers were actively trying to pursue theft cases more strongly can be used to predict the likely level of true theft.

The AUGE believes that the most appropriate method is method 5 and data and information of theft statistics and initiatives form shippers has been requested. During the analysis of the data the methodology will evolve further and the AUGE will consider views of the industry bodies during the initial consultation period.

It is recognised that true theft levels are unknown, and so this part of the Unidentified Gas calculation is concerned with estimating a reasonable figure between the known lower and upper limits that all parties are happy with. Various pieces of evidence (such as the effect of shipper theft-detection initiatives) can be used to target the final value but not to define it explicitly.

Theft levels are also likely to differ between geographical areas, with such activities likely to be centred in large cities. This will also be incorporated in the calculation by carrying it out on an LDZ by LDZ basis.

6.5 Metering Errors

Metering errors (at both the LDZ entry points and the supply points) can have an effect on the calculated loads for each market sector if there is found to be a non-zero bias over time. Any such bias should be dealt with as a correction to RbD rather than UG, but the two areas are linked and the associated volumes could still be estimated by the AUGE.

The AUGE understands that LDZ meters and LSP meters are regularly checked and maintained and demonstrate no particular bias in metering error. The LSP meters are of different construction to SSP meters, in that they are typically of a rotary/turbine meter type and constructed of parts less likely to distort over time. When there have been incidents of large scale metering error these are corrected accordingly. SSP meters contain a diaphragm which can warp over time and therefore can have a longer term drift effect. As this investigation is aimed at establishing UG particularly for the LSP market, and SSP metering will not be used in the formulation of the estimate of UG, any potential bias in the SSP meters will have no effect and therefore can be ignored.

Mods 194/194A and 228/228A noted that a consensus had been reached that no such long-term bias exists and metering error does not contribute to Unidentified Gas or RbD error over time.

The AUGE concludes that Metering Error does not contribute to Unidentified Gas.

6.6 Unknown Sites

These are sites that are unknown to the Xoserve system because they are taking gas but do not even have an MPRN. It is known that a small number of such sites exist, but at the moment it is not clear whether their effect on Unidentified Gas is above negligible. Data has been requested from Xoserve/Shippers on this subject.

7 Consultation Questions and Answers

This section captures the questions raised by the Industry Bodies during the consultation periods and the AUGE responses. The questions have been assessed against the AUGE Guidelines [1] and responses provided as appropriate. All questions and answers will be published on the Joint Office website. Identical questions or very similar questions will be given a collective answer where appropriate.

7.1 Consultation Period 3rd May-15th June 2011

This section will be completed following initial consultation period.

7.2 Consultation Period 1st August -31st August 2011

This section will be completed following second consultation period.

8 Contact Details

Questions can be raised with the AUGE at AUGE@gl-group.com

9 References

[1] Guidelines for the Appointment of an Allocation of Unidentified Gas Expert and the provision of the Allocation of Unidentified Gas Statement V3.0, 24th February 2011

[2] Mod 369 Re-establishment of Supply Meter Points – measure to address shipperless sites

[3] Mod 194 Framework for correct apportionment of NDM error

[4] Mod 194a Framework for correct apportionment of LSP unidentified gas

[5] Mod 228/228A Correct apportionment of NDM Error – Energy

[6] UNC Modification Proposals 228 and 228A Correct Apportionment of NDM Error – Energy. An Assessment by TPA Solutions Ltd, January 2010

[7] Mod 229 Mechanism for Correct Apportionment of Unidentified Gas

[8] Theft of Electricity and Gas "Next Steps", OFGEM, January 2005

[9] Reducing Supplier Disincentives to Detect and Investigate Gas Theft – Uniform Network Code Proposal UNC231V and other Changes, OFGEM, December 2010

[10] Mod 0274 Creation of a National Revenue Protection Service, Version 1.0, 11th November 2009, Eon

[11] Mod 277 Modification Report "Creation of Incentives for the Detection of Theft of Gas (Supplier Energy Theft Scheme)" Version 2.0, 20th January 2011, Joint Office of Gas Transporters

[12] Mod 346 An Alternative to the Supplier Energy Theft Scheme Based on Throughput Version 2.0, 20th January 2011, Centrica

[13] Theft of Gas Info Pack, Xoserve, March 2011

[14] Uniform Network Code (UNC) 194, 194A, 228, 228A and 229: These proposals deal with the identification and apportionment of costs of Unidentified Gas, OFGEM, 26th May 2010

[15] Uniform Network Code (UNC) Transportation Principal Document

[16] National Leakage Tests, GL Noble Denton, 2003

[17] Own Use Gas Model, GL Noble Denton, 2006

[18] Theft of Electricity and Gas, Discussion Document, OFGEM, April 2004

10 Glossary

AGI	Above Ground Installation
AQ	Annual Quantity
AUGE	Allocation of Unidentified Gas Expert
AUGS	Allocation of Unidentified Gas Statement
CSEP	Connected System Exit Point
DM	Daily Metered
ECV	Emergency Control Valve
EUC	End User Category
IGT	Independent Gas Transporter
LSP	Larger Supply Point
MAM	Meter Asset Manager
MEG	Monoethylene Glycol
MPRN	Meter Point Reference Number
NDM	Non Daily Metered
OUG	Own Use Gas
RbD	Reconciliation by Difference
SSP	Smaller Supply Point
TPD	Transportation Principle Document
UIP	Utility Infrastructure Provider
UNC	Uniform Network Code
UG	Unidentified Gas