

Shrinkage and Leakage Smart Metering Report

23/06/2020

Joint Gas Distribution Network Submission

Public

Gas Distribution Networks review the potential benefits Smart Meters could have on the reporting of Shrinkage and Leakage, and consult with stakeholders and other interested parties, before submitting a Joint Report to Ofgem every two years.



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1 Executive Summary

This is the fourth Joint GDN Shrinkage and Leakage Smart Metering Report (SLSM). The first of these reports was published on 31st July 2014, and after a period of consultation with stakeholders, was supplemented with an additional report in early 2015. In this review, published on 6th February 2015, the Gas Distribution Networks (GDN's) outlined the potential uses that the Smart Meter rollout may offer for the assessment of Shrinkage volumes. Building on the 2015 report, the SLSM in 2016 delivered an update on research into the legitimacy of these potential benefits.

The latest SLSM was published on 31st July 2018 and endeavoured to comprehensively review the progress of the ongoing rollout as part of the Smart Meter Implementation Programme, alongside an assessment of the suitability of the use of Smart Metering Data as an alternative to the existing Leakage Reduction Management Model (LRMM) to calculate levels of Shrinkage and Leakage. This assessment looked into current levels of Meter coverage, ability to access commercial and industrial meter data (large users), and the potential methods of using smart metering data to validate the reporting of results from the Shrinkage and Leakage Model (SLM). The report concluded that the levels of smart meter coverage at that time prohibited the use of smart metering data as an alternative to the SLM.

Although significant and extraordinary progress has been made in expanding smart meter coverage, and in the technological advances and range of data that the meters and infrastructure can deliver, the available sample size, lack of large consumer data and potential for meter error, mean that smart meters do not afford a viable methodology with which to replace or validate the SLM

Any validation of the current model outputs, and previous reports have looked into areas such as Average System Pressure and Service Pipe Material data, would require the aforementioned 'very high' levels of system coverage, would need to assume 100% meter accuracy, and would potentially require Suppliers to survey an entire service pipe on installation of each smart meter, up to where each connects to the parent main (the key factor in service leakage calculation). It is for these reasons that potential validation of the SLM is considered unlikely to occur.

Similarly, only those same 'very high' smart meter coverage requirements would enable a smart meter dataset to replace the current methodology. This is reinforced by the determination that the 90%+ coverage necessitated to ensure accuracy, cannot be reached with the exclusion of demand from meters that will not be covered by this rollout. As stated in the 2018 SLSM, this was also confirmed by a third-party report, commissioned by the Gas Retail Group¹, who agreed that any attempt to utilise smart metering data in this manner would remove any clarity on sources of emissions and would likely hinder effective attempts to reduce or eliminate them.

Considering the previous submissions and analysis undertaken, it is not anticipated that the use of smart metering data will present an opportunity to enhance the current methodology provided by the Shrinkage and Leakage Model unless the very high coverage levels can be attained in the future. The GDN's will, of course, continue to work with and fully engage with the wider industry and stakeholders to continue to improve accuracy and reduce environmental emissions.

In-line with the GDN's aspiration to improve stakeholder engagement and augment wider understanding of Shrinkage and Leakage processes and methodologies, we of course welcome any feedback from the wider industry in relation to this document.

¹ <https://www.gasgovernance.co.uk/Shrinkage/Retail-Study>
Energy UK Gas Retail Group Shrinkage Study

2 Introduction

Gas Distribution Networks (GDNs) are required to produce and submit a joint “Shrinkage and Leakage Smart Metering Report” (SLSM) to the Authority (Ofgem) once every two formula years. There is an obligation set out in the Special Conditions applicable to all regulated GDNs (Special Condition 1F Part G). A copy of this License Condition can be found in Appendix 1.

3 Purpose and Methodology

The purpose of the biennial SLSM reports is to evaluate the relevance of Smart Metering data to the output of the SLM and examine the potential implications of this data on the construction, operation and reporting of environmental emissions and overall shrinkage produced by the model.

Prior to submitting the final SLSM Report to the Authority, GDN’s are required to consult with Gas Shippers and other interested parties. A draft of this report will be published on 30th June 2020 in-line with this requirement.

4 Summary of Smart Metering in the UK

4.1 Background

It is the aspiration of the UK Government that all energy suppliers install smart meters in every home and small business across England and the devolved nations. There are approximately 26 million homes which will require installation if suppliers are to meet the original target of every home and small business being offered a smart meter by the end of 2020.

Smart meters provide customers with accurate information about their individual energy use to allow them to manage and reduce their usage, save money and reduce emissions. Gas and Electricity suppliers are required by their licence, to take all reasonable steps to roll out smart meters to their domestic and small commercial customers by the aforementioned end of 2020 date.

Smart meters provide customers with:

- Amount of energy is being used in real time
- Amount of energy was used in the previous hour, week and month, alongside costs
- Updates every half hour for Gas usage

If customers have a pre-pay meter, it will also highlight:

- Remaining credit
- Remaining emergency credit
- Debt balance (if any)
- If credit is running low

4.2 Household Impact

In March 2019, Smart Energy GB produced their Smart Energy Outlook² document, and in March 2020, Robert Cheesewright, Director of Corporate Affairs at Smart Energy GB, announced the latest statistics regarding smart meter roll out. Key details include:

² <mailto:https://www.smartenergygb.org/en/resources/press-centre?tab=4&docspage=1&filter=>
Smart Energy GB Outlook Document 2019

- 21.5 million smart meters (both Gas and Electricity) are now operating in homes across Great Britain (March 2020).
- 98% of people across Great Britain are aware of smart meters (March 2019).
- 29% of people now have a smart meter installed (March 2019).
- 66% of people with a smart meter would recommend getting one (March 2019).
- Almost 13 million or 39% of non-owners say they would seek or accept a smart meter within the next six months (March 2019).
- Amongst the non-smart meter population, most likely to request or accept a smart meter, by location is in the East Midlands (43%) and Scotland (42%).

5 Update on the Smart Metering Implementation Programme

The Smart Metering Programme originated in 2011 with a period of engagement with the energy sector, consumer groups and other stakeholders. Installation of the meters began in November 2016 and was originally set to run until the end of 2020.

The latest statistics, as of 31st March 2020 (Q1), show there were 22.1 million gas meters operated by large energy suppliers in domestic properties in Great Britain. Of these, 30% were smart meters operating in smart mode. This rises to 37% when smart meters operating in traditional mode are included.

From the perspective of the gas industry, approximately 6.6 million of these smart meters are operating in smart mode with a further 1.2 million operating in traditional mode. As at the end of March 2020, 0.2 million smaller, non-domestic customers have smart meters operating in smart mode (35% of all meters in operation).

Industry information from the Data Communications Company (DCC)³ show that as of 31st March 2020, there were 4.3 million domestic SMET2 meters connected to the system. This has increased from 3.3 million at the end of December 2019. The number of meters installed in Quarter 1 of 2020 was significantly down on the same quarter in 2019, largely due to the impact of the COVID-19 pandemic and the subsequent working restrictions imposed.

It is evident that the COVID-19 pandemic holds significant implications for the Governmental and Regulatory target to rollout smart meters to all customers by the end of 2020, and within an open letter from the Authority to all Suppliers from 19th June 2019⁴, there was an acknowledgement that “It is clear that smart meters will need to continue to be installed beyond 2020. BEIS are considering the post-2020 policy and regulatory landscape for smart meters”.

The existing obligation on energy suppliers to take all reasonable steps to ensure installation of smart meters is due to expire on 31st December 2020. On the 1st October 2019, the Government and the Authority launched a consultation on a new regulatory framework to extend the rollout beyond 2020. Under the proposed new obligation, the Authority would continue to provide regulatory oversight of the programme and suppliers compliance with the smart meter rollout.

This consultation closed on 26th November 2019, and on 19th June 2020 the Department for Business, Energy and Industrial Strategy (BEIS) issued its response⁵. The Government intends to introduce a new regulatory framework for the next phase of the rollout, with defined outcomes for all energy suppliers to deliver a “market

³ <https://www.gov.uk/government/statistics/statistical-release-and-data-smart-meters-great-britain-quarter-1-2019>
Smart Meter Statistics – Q1 2019

⁴ <https://www.ofgem.gov.uk/publications-and-updates/smart-meter-rollout-energy-suppliers-progress-and-future-plans-open-letter-june-2019>

Smart Meter Rollout: Energy Suppliers Progress and Future Plans

⁵ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/893124/delivering-smart-system-post-2020-govt-response-consultation.pdf

Response to Consultation on Smart Meter Policy Framework Post 2020

wide” rollout of smart metering as soon as practicable. Acknowledging the impact of COVID-19, a six-month extension to the “all reasonable steps” obligation has also been confirmed, to 30th June 2021.

The proposed framework includes the implementation of a four-year framework to reach market-wide coverage of smart meters, to begin on the day following the agreed six-month extension. This framework and extension of obligation is now back out for consultation, which is due to close in August 2020.

Second generation SMETS2 smart meters, connected to the national smart metering communications network and managed by DCC, will now be regarded as the default meter in the majority of installations ongoing, with the migration of SMETS1 meters into the national infrastructure, started in 2019, continuing once the pandemic is over.

The GDN’s will continue to engage with the industry regarding access to smart meter data. Due to the delays highlighted above, and ongoing concerns around the use of consumer data, there has been no real progress in this area, however, GDN’s have not been mandated to be full Data Communications Company (DCC) users and currently do not intend to pursue access. Historic concerns have also been raised by Citizens Advice surrounding the potential handling and use of consumer data without explicit consent.

Considering the current relatively low-level coverage of smart meters and comparing to the accuracy and reliability of the SLM, we do not believe that a change in methodology to utilise smart meter data would be possible, or desirable, at this time.

6 Suitability of Smart Metering Data as an alternative to the Shrinkage and Leakage Model in the calculation of Shrinkage and Leakage volumes.

6.1 Summary

In our 2018 report, the GDN’s re-capped on previous analysis which considered:

- Issues around Gas in/Gas out as a viable alternative to the SLM.
- Levels of Smart Meter coverage required to maintain the assumed percentage Shrinkage error of the SLM (Oxera Report).
- Problems concerning access to commercial and industrial meter data.

GDN’s believe that, although considerable progress has been made across the smart meter implementation programme since 2018, the fundamental barriers to embracing smart metering data as a replacement for the Shrinkage and Leakage Model (SLM), remain unchanged.

Below is a summary of the main points from the various assessments and analysis carried out by the GDN’s and third-parties across RIIO-GD1.

6.2 Smart Metering Data as a replacement for SLM

For the 2016 Shrinkage and Leakage Smart Metering Report (SLSM), the GDN’s considered the difference between gas volumes entering the network via National Offtakes, and the gas leaving the downstream network via smart meters, and whether this disparity in volume could be deemed to represent leakage, theft of gas, own use gas, and unregistered/shipperless sites. GDN’s were jointly of the opinion that this is not the case as merely measuring gas in versus gas out and attributing any losses to Shrinkage and Leakage does not account for the source and accuracy of these emissions and would not provide the transparency required by GDN’s with which to focus network investment.

It also became apparent at this time, that replacement of the SLM would require significant meter coverage, as any un-metered demand (i.e. not measured by a smart meter) would be lost and therefore extremely difficult, if not impossible, to quantify accurately. Also, any late meter registrations or meter errors would likely make this process considerably less reliable than the existing methodology.

These findings led to the GDN's, commissioning Oxera, a global economics consultancy, to provide advice on the viability, and level of required sampling coverage, to enable smart metering data to maintain the assumed percentage shrinkage error of the current calculation methodology (SLM). This report was published in August 2016 and is discussed in the following section.

6.3 Smart Meter Coverage

In the 2018 SLSM, the GDN's reported on the findings from the published 2016 Oxera Report⁶ as well as commissioning updated analysis. GDN's had always asserted that for metering data to be considered as a viable alternative to the SLM, close to 100% coverage across the networks would be required to maintain the level of accuracy and confidence. To confirm this assertion, GDN's commissioned the Oxera Report which considered the use of sampling techniques to estimate network leakage using smart meter data. Sampling theory suggests that a representative subset of data from smart meters could be extrapolated to approximate the level of aggregate (or population) usage, with a 'margin of sampling error'. This estimate could then be compared with the measured gas volumes through the offtakes and into the network to calculate overall leakage. The report focussed solely on domestic consumption as smart meters were being rolled out to domestic consumers only.

The full report can still be found online and provides a methodology, and statistical levels of smart meter coverage, required to accurately estimate gas lost from the network. Once again, to summarise the main findings of this report:

- Smart meter coverage to accurately estimate leakage from the network is high.
- Smart meter coverage requirements for domestic consumers across all three settings (see Table 1) are very high when the required sampling error is 0.1% or less.
- Although the City and Town settings highlight lower coverage requirements than a Rural setting, they remain high (92% for cities and 98% for towns).
- The report concludes that the 0.1% sampling error is necessary to accurately estimate leakage. If a higher sampling error were to be acceptable in certain scenarios, then required coverage would be lower across all settings.

Table 1 – Sampling Error and Associated Coverage for All Settings

Sampling error (%)	Error as a % of leakage	Error as a % of UIG	City	Town	Rural
0.04	7	1	99	100	100
0.06	10	1	97	99	100
0.08	13	2	95	99	100
0.1	17	2	92	98	100
0.2	33	4	75	91	100
0.4	67	9	43	72	99
0.6	100	13	25	54	97
0.8	133	17	16	40	94
1	167	22	11	30	92

The report concludes that although increased precision could be achieved once a meaningful smart meter dataset was available, it was not possible to assess this improved accuracy at current levels of coverage. It goes on to assert that even providing this high level of coverage, there is no evidence that shrinkage error would improve beyond the current methodology.

⁶ <https://www.gasgovernance.co.uk/sites/default/files/ggf/Estimation%20of%20network%20leakage%20with%20smart%20meters.pdf>

6.4 Large Commercial and Industrial Consumers

The 2018 SLSM also reported on the absence of smart meter data from the larger Industrial and Commercial users, stating that these customers account for approximately 40% of consumption on a typical network and this would inevitably introduce considerable uncertainty into any estimates of Leakage and Shrinkage calculated through the smart meter methodology.

The current programme targets domestic and small commercial consumers only, and any customer with a meter larger than U6 are offered an Advanced Meter (AMR), whereby output is communicated to the shipper rather than DCC, adding another layer of complexity in accessing this data.

7 Access to Smart Metering Data

As stated earlier in this review, although significant progress has been made in the implementation programme since the last SLSM, the level of smart meter coverage at this time would mean accessing data through DCC and would not provide any consequential benefit towards increasing the accuracy and reliability of the current leakage calculation methodology. Ongoing issues around the recording, use and storage of consumer data, without explicit consent also adds to a lack of justification.

8 Conclusion

This is the fourth Shrinkage and Leakage Smart Metering Report of the current price control period, and in each subsequent report, we have endeavoured to explore the potential benefits to the annual shrinkage volume calculation that the current rollout may provide, from replacement of the current methodology, to the use of the data in validation of Shrinkage and Leakage Model (SLM) outputs (see 2018 SLSM).

Throughout this time, although significant and extraordinary progress has been made in expanding smart meter coverage, and in the technological advances and range of data that the meters and infrastructure can deliver, the available sample size, lack of large consumer data and potential for meter error, mean that smart meters do not afford a viable methodology with which to replace or validate the SLM (the various requirements to enable this, the value of doing so and the stated restrictions, can be found in Appendix B and C).

Any validation of the current model outputs, and previous reports have looked into areas such as Average System Pressure and Service Pipe Material data, would require the aforementioned 'very high' levels of system coverage, would need to assume 100% meter accuracy, and would potentially require Suppliers to survey an entire service pipe on installation of each smart meter, up to where each connects to the parent main (the key factor in service leakage calculation). It is for these reasons that potential validation of the SLM is considered unlikely to occur.

Similarly, only those same 'very high' smart meter coverage requirements would enable a smart meter dataset to replace the current methodology. This is reinforced by the determination that the 90%+ coverage necessitated to ensure accuracy, cannot be reached with the exclusion of demand from meters that will not be covered by this rollout. As stated in the 2018 SLSM, this was also confirmed by a third-party report, commissioned by the Gas Retail Group⁷, who agreed that any attempt to utilise smart metering data in this manner would remove any clarity on sources of emissions and would likely hinder effective attempts to reduce or eliminate them.

Considering the previous submissions and analysis undertaken, it is not anticipated that the use of smart metering data will present an opportunity to enhance the current methodology provided by the Shrinkage and Leakage Model unless the very high coverage levels can be attained in the future. The GDN's will, of course,

⁷ <https://www.gasgovernance.co.uk/Shrinkage/Retail-Study>
Energy UK Gas Retail Group Shrinkage Study

continue to work with and fully engage with the wider industry and stakeholders to continue to improve accuracy and reduce environmental emissions.

Appendix A - Gas Transporter Licence Special Condition 1F Part G

Part G: Report to the Authority on the use of Smart Metering Data

1F.31 The Licensee must, in conjunction with other DN Operators, ensure that a single report is submitted to the Authority once in every two Formula Years called the Shrinkage and Leakage Smart Metering Report (“the SLSM Report”).

1F.32 The first SLSM Report must be submitted to the Authority not later than 31 July 2014, and subsequent SLSM Reports must be submitted to the Authority not later than 31 July once every two Formula Years.

1F.33 The purposes of the SLSM Report are:

- (a) to review the collection and use of Smart Metering Data that may be relevant to The Shrinkage and Leakage Model; and
- (b)) to explain the relevance and implications of such data for the construction and operation of The Shrinkage and Leakage Model and for the reporting of information derived from it.

1F.34 The SLSM Report must be made publicly available and must include:

- (a) an update on the current status of the national smart metering implementation programme; (b) the DN Operators’ assessment of the suitability of the use of Smart Metering Data as an alternative to the use of The Shrinkage and Leakage Model to calculate the levels of gas Shrinkage and gas Leakage with respect to each Distribution Network that they operate;
- (c) the steps that DN Operators are taking to ensure that they have appropriate access to Smart Metering Data; and
- (d) how each Licensee intends to use Smart Metering Data to validate The Shrinkage and Leakage Model and the reporting of information under it.

1F.35 Before submitting the SLSM Report to the Authority, the Licensee must, in conjunction with other DN Operators:

- (a) consult on a draft of the report with gas shippers and other interested parties;
- (b)) allow all such persons a period of at least 28 days within which to respond to the consultation;
- (c) ensure that all non-confidential responses to the consultation are made publicly available; and
- (d) use best endeavours to ensure that those responses are summarised and taken into account in the final SLSM Report prepared for submission to the Authority.

1F.36 The Licensee must submit the SLSM Report to the Authority in such form and manner as the Authority may direct.

Appendix B - Assessment of Shrinkage Measurement (Gas In/Gas Out)

Metering level options	Requirements	Potential Value	Restrictions
<p>Offtake Metering In, Smart Metering Out – Full Coverage</p>	<p>Metering at offtakes – already in place.</p> <p>Statistically valid sample of Smart Meters in place within each LDZ. High level of coverage is required (see Section 6)</p> <p>Data requirements would, as a minimum, be an annual report of the actual demand.</p>	<p>Little additional cost to the Smart Metering roll out for additional meters.</p> <p>Due to the requirement for a statistically valid sample of meters (with at least one full year of data) to be in place before any calculations of the gas lost could be made.</p>	<p>Smart Metering is only applied to U6/G4 size meters therefore excluding larger domestic and commercial/industrial consumers – these consumers (excluding daily metered sites) account for approximately 40% thereby adding significant uncertainty to estimates of lost gas, including theft and own use gas. This would require some form of alternative modelling to determine what is lost gas and how much I&C customers are using.</p> <p>Such an approach whereby shrinkage and leakage are measured at an LDZ rather than sub-network level would significantly impact the way in which shrinkage is managed as there will not be the same level of the granularity regarding the source of the lost gas.</p>

Metering level options	Requirements	Potential Value	Restrictions
<p>Offtake Metering In, Smart Metering Out – Representative Networks</p>	<p>Metering at offtakes – already in place</p> <p>Statistically valid sample of Smart Meters in place within each LDZ. High level of coverage is required (see Section 6)</p> <p>Data requirements would, as a minimum, be an annual report of the actual demand.</p>	<p>As above; however, instead of waiting for statistically representative sample of Smart Meters across the LDZ before any perceived benefits may be realised, specific networks are targeted in the meter roll out allowing for statistically representative number to be achieved in these networks earlier and thus allowing the measured demand from Smart Meters in these networks to be applied to other similar networks to build an overall expected demand.</p>	<p>Such an approach would require that shippers / suppliers coordinate with GDNs to focus roll out of Smart meters to specific networks if the full perceived benefits with regards to shrinkage and leakage are to be realised before the completion of the implementation programme.</p>
<p>Offtake and Governor Metering In, Smart Metering Out</p>	<p>Additional meters to be fitted at each network governor. There are approximately 22,000 governors nationally and to achieve the level of metering accuracy required, it is likely to cost at least £50k-£100k per governor to include orifice meter, pressure/temperature correction, power source.</p> <p>Smart Metering to measure the gas out.</p> <p>Statistically valid sample of smart meters installed in individual low-pressure sub-networks with appropriate metering at the governors.</p>	<p>Identify sub-network specific gas loss, allowing for investigative and targeted action to reduce loss and manage shrinkage and leakage.</p>	<p>This would require significant investment in flow monitoring, which has not been allowed for in RIIO-GD1.</p>

Appendix C - Opportunities to Improve/Validate SLM utilising Smart Meter Data

Component of model	Input	Opportunity from Smart Metering	Data Required	Action	Cost	Potential Value / Restrictions
Low Pressure Leakage	Pressure data	No impact on recorded data – Smart Meters do not have the ability to record pressure and would require a pressure sensor before the regulator for this to be of any use if they did.	NA	NA	NA	NA
	Average System Pressure	This is currently calculated using a combination of recorded pressures and network analysis models. Data from Smart Meters may allow for minor improvements in the validation of these models	6-minute flow data	The GDNs have already fed in the request for this data to be made available	tbc	<p>Potential Value: -</p> <ul style="list-style-type: none"> • Fine tune the validation of network analysis models • Refine pressure management • Validate the average demand used to calculate average system pressures <p>Restrictions</p> <ul style="list-style-type: none"> • Requires high coverage (90%+) of Smart Meters to provide meaningful results – aggregation of smart meter data • Potentially leakage forecasts could increase • Difficult to assess on medium/large networks

Component of model	Input	Opportunity from Smart Metering	Data Required	Action	Cost	Potential Value / Restrictions
	Customer Numbers	No impact – customer numbers already known and held by Xoserve. Shipper led roll out means there is very limited opportunity to determine shipperless sites from installation of gas meters	NA	NA	NA	NA
	Mains pipe material / length	No impact	NA	NA	NA	NA
	Service pipe material	Possible opportunity to collect data on service types; however, this would require Shippers recording service pipe material during Smart Meter roll out and providing this information to the GDNs	Service pipe material to be recorded by Shippers on roll out and provided to GDNs	Engage with shippers to establish if the collection and transfer of this information is feasible as part of roll out	Unknown	Low pressure services currently account for 16-22% of low-pressure leakage, mostly due to steel services. Populations are estimated in the shrinkage and leakage model. Improvements would be expected to be realised on completion of roll out
	Gas quality information	No impact - Smart Meters will not measure gas quality information	NA	NA	NA	NA
	MEG Concentration	No impact – Smart Meters will not have the functionality to measure MEG concentrations	NA	NA	NA	NA

Component of model	Input	Opportunity from Smart Metering	Data Required	Action	Cost	Potential Value / Restrictions
Medium Pressure Leakage	Pipe material / length	No impact – the introduction of Smart Meters will not provide additional information on the makeup of the medium pressure network	NA	NA	NA	NA
AGI Leakage / Venting	AGI Numbers / Types	No impact – Smart Meters will not provide additional information with regards to AGI numbers / types and venting	NA	NA	NA	NA
Interference Damage	Number of Incidents	No impact – Smart Meters will not impact on the number of incidents that occur	NA	NA	NA	NA
Own Use Gas		No impact as in the current model this is a factor of throughput	NA	NA	NA	NA
Theft of Gas		No impact as in the current model this is a factor of throughput	NA	NA	NA	NA