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# Shrinkage and Leakage Model Review Final Report

## Joint Distribution Network Publication

March 2023

# Shrinkage Leakage Model Review

## Final Report

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# Shrinkage Leakage Model Review

## Final Report

## Process Background

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**The Shrinkage & Leakage Model Review process is an opportunity for Gas Distribution Networks (GDNs) and interested stakeholders to formally consult and review on an annual basis the components and assumptions used within the Shrinkage and Leakage Model (SLM), by way of a 28-day consultation period. This document contains the outcome of the initial consultation which completed on 17<sup>th</sup> March 2023.**

The purpose of this review is to assess how the SLM can better achieve the objective set out in Special Condition 4.4. Part D of the Licence. This document fulfils Licence obligation 4.4.16 which requires the Licensee to:

- a) keep the SLM under review and propose revisions that maintain or improve the accuracy of its calculation of Shrinkage and Leakage; and
- b) reviews the methodologies for the SLM to verify comparability of the Shrinkage and Leakage volumes produced by each DN Operator.

The GDNs published a joint report on the 17th February 2023, and we are pleased to have received feedback from Centrica PLC.

The GDN's would like to take this opportunity to assure any stakeholders that, whilst the annual SLM Review process provides a positive outlet for review and comment from the wider industry, we also wish to continue our commitment to understanding views and concerns raised via the regular Shrinkage Forums facilitated by the Joint Office of Gas Transporters. Forthcoming meetings are scheduled for 20th September 2023 and 22nd November 2023.

These forums offer a valuable opportunity for interested parties to further understand elements of the Shrinkage and Leakage assessment and the areas of Shrinkage of most interest to them, and to allow stakeholders to directly address these points to the GDN's.

We remain committed to improving all aspects of Shrinkage measurement and reporting. We review and consider all feedback to help develop our future work's programme relating to Shrinkage and Shrinkage modelling. We consider the cost to consumer and potential benefits to consumer and society when prioritising future programmes of work.

Finally, the GDN's would like to, once again, thank Centrica PLC for the response to this consultation. Your feedback on this process is valued and very much welcomed.

# Shrinkage Leakage Model Review

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### Representation from Centrica PLC

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**Centrica PLC submitted a response to the consultation via email on 17<sup>th</sup> March 2023, comprising of several queries related to the methodologies and movement of shrinkage performance, and how and when our commitments could impact on GDN shrinkage volume assessments.**

The non-confidential response requested the following points should be considered, our joint GDN response to each of these is below.

**The Shrinkage Profiling project should be prioritised:**

We welcome the gas distribution network operators (GDNs) progressing the *Shrinkage Profiling* project during 2023-24. Since 2018, we have consistently highlighted that the assumed 'flat' shrinkage profile may lead to the misallocation of volumes between shrinkage and 'unidentified gas'. The misallocation may create the risk of market distortions. We recommend the *Shrinkage Profiling* project be prioritised given the potential detriment of the 'flat' shrinkage profile to consumers, shippers and suppliers.

*Joint GDN Response:*

*Thank you for the feedback, we acknowledge the importance of this project to Centrica PLC and other impacted stakeholders. The project requires a full scope and workplan to review and determine the steps required to achieve a desired outcome. Preliminary target date to complete this project, without full knowledge of associated requirements, restrictions and modification pathways, is 2023/24.*

**The “Drivers of Change” should be reinstated:**

In previous consultations, the GDNs identified those factors that caused year-on-year changes in shrinkage volumes and the magnitude of each associated impact. We consider that the GDNs including this information improved the quality of previous consultations. It is unclear why this information was not included in the current consultation. We recommend that this information is included in the final report for 2023 and is included in all future consultations and final reports.

*Joint GDN Response:*

*We have included the information you requested within this document and will continue to do so in future publications. Please see section Supplementary Performance Breakdown.*

# Shrinkage Leakage Model Review

## Final Report

### Representation from Centrica PLC

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#### **Additional information should be provided:**

In our responses to previous annual consultations, we highlighted that the information included did not allow us to independently assess whether the proposed commitments were focussed on those areas which should be treated with priority. The same concern applies to the 2023 consultation. We suggest the following information should be included:

- a) an explanation of how the projects that the GDNs propose to progress were selected from the list of candidate projects and why those projects were prioritised;
- b) the potential materiality of the impact of the outcome of each project on shrinkage volumes;
- c) an estimate cost of delivering each project;
- d) a timeline showing the expected milestones for each project; and
- e) a summary of the risks that might each project being successfully completed.

For each project, it would also be helpful if the GDNs explain how they will engage stakeholders, how stakeholders will be involved in project delivery and what might be required of stakeholders.

#### *Joint GDN Response:*

*We have included a further breakdown of the project information later in this document.*

*The process of determining viability and selection of projects for consideration as future year commitments is based on several factors. Within this year's publication we have committed to three areas of focus (50% of GDN commitments) to projects either requested or instigated by Stakeholders.*

*When considering future GDN instigated projects, we continually assess the enduring impact of each of these and whether they are in the best interest of the customer. The SLM is based on leakage rates that age over time, and whilst a repeat of projects (such as the National Leakage Tests) would give a periodic refresh of these rates, we believe that committing to the Digital Platform for Leakage Analytics project as our major joint GDN commitment, will revolutionise and future proof the Shrinkage assessment process. The introduction of new sensor equipment within an operational area would give an ongoing refreshment of Shrinkage volumes in a credible and measured manner, capturing factors such as degradation of assets over time and allowing replacement strategies to be produced that most positively impact the environment and customer.*

# Shrinkage Leakage Model Review

## Final Report

### Commitments Additional Information

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**In the Joint GDN consultation document we highlighted our commitments to take forward into future years. This section provides additional information for each of the commitments as a result of the representation by Centrica PLC.**

**Project Name:** Digital Platform for Leakage Analytics (SIF Project).

**Project Team:** Cadent, SGN, WWU, NGN, National Gas, Guidehouse.

**Shrinkage Components:** Pipe Leakage, AGI Leakage.

**Selection Reason:** The Strategic Innovation Fund mechanism facilitates a new approach to innovatively improve the credibility of the shrinkage calculation. The SLM currently relies on leakage rates that have undergone periodic refreshment, however, as the asset base changes over time these might become less fit for purpose. The opportunity to unlock real-time emission sensing equipment coupled with a new hydraulic model ensures that shrinkage calculations will remain relevant and improve modelling credibility.

**Expected Materiality:** GDNs are unsure of the expected impact of replacing the SLM with a new digital platform in relation to how this would impact overall emissions volumes. It is expected to unlock greater emissions reporting accuracy and the ability to target the replacement or refurbishment of those assets with the greatest negative impact on the environment.

**Costs:** Application for Beta phase funding has been submitted incorporating significant GDN contribution.

**Expected Timelines:** Completion of Beta phase 2026 (subject to application approval).

**Stakeholder Engagement:** Engagement will continue through the Shrinkage Forum environment with focused sessions with interested parties captured as part of the project engagement plan. Any recommendation for changes to the SLM, Licence or UNC would follow the applicable modification channels, which would involve stakeholder consultation.

# Shrinkage Leakage Model Review

## Final Report

### Commitments Additional Information

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**Project Name:** Shrinkage Profiling.

**Project Team:** SGN, NGN, Cadent, WWU.

**Shrinkage Components:** Annual Profiling.

**Selection Reason:** Stakeholder Representation.

**Expected Materiality:** None; GDNs will continue to apply the SLM methodology and determine the annual volumes. Procurement of gas will remain as a flat daily volume, however system profiling of this gas volume would likely follow a typical demand profile taken from historic data trends.

**Costs:** Unknown. Project has not yet commenced.

**Expected Timelines:** Unknown. Project has not yet commenced. Target 2023/24.

**Stakeholder Engagement:** Engagement will primarily be through the Shrinkage Forum environment. Focused sessions with interested parties may be required for assessment and understanding purposes. Any recommendation for changes to the UNC would follow the applicable modification channels.

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**Project Name:** Independent Shrinkage Expert (MOD0828R).

**Modification Owner:** OVO Energy.

**Shrinkage Components:** All.

**Selection Reason:** Stakeholder Modification – the modification would benefit from input from Shrinkage modelling subject matter experts.

**Expected Materiality:** Unknown.

**Costs:** Unknown.

**Expected Timelines:** Unknown.

**Stakeholder Engagement:** GDNs will continue to support the associated workgroup sessions.

# Shrinkage Leakage Model Review

## Final Report

### Commitments Additional Information

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**Project Name:** Own Use Gas Review.

**Project Team:** NGN, SGN, WWU, Cadent.

**Shrinkage Component:** Own Use Gas.

**Selection Reason:** Stakeholder Representation.

**Expected Materiality:** Unknown

**Costs:** Initial phase costs £150,000.

**Expected Timelines:** Initial phase complete before end of 2023. Consultation for modification to SLM (if required) would follow satisfactory completion of project.

**Stakeholder Engagement:** Engagement will primarily be through the Shrinkage Forum environment. Changes to Own Use Gas methodology and any associated baseline impacts would require a SLM modification which would include a 28-day industry consultation exercise as specified within the Licence.

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**Project Name:** Pipe Remediation Review.

**Modification Owner:** SGN.

**Shrinkage Components:** Pipe Leakage.


**Selection Reason:** Robotic technology has been used to internally remediate mains causing little disruption to customers. Within the SLM, any pipes remediated with robotic technology are still assumed to have the same characteristics as a pipe without remediation, artificially inflating emissions.

**Expected Materiality:** Low (minor reduction in leakage for those assets remediated).

**Costs:** £20,000

**Expected Timelines:** Consultation released during 2023/24 pending the creation of a robust methodology change proposition.

**Stakeholder Engagement:** Engagement will primarily be through the Shrinkage Forum environment. Changes to pipe leakage methodology and any associated baseline impacts would require a SLM modification which would include a 28-day industry consultation exercise as specified within the Licence.





# Shrinkage Leakage Model Review

## Final Report

### Commitments Additional Information

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**Project Name:** AGI Venting.

**Project Team:** NGN, WWU.

**Shrinkage Component:** AGI Venting.

**Selection Reason: Current** AGI Venting volumes are fixed for each LDZ and derived from a Watt Committee report dated 1994. This element of the SLM is the oldest assumption and contributes approximately 7.2% of emissions. This percentage will increase annually as a factor of total Shrinkage due to the flat nature of reporting.

**Expected Materiality:** Low (initial analysis estimates a reduction of between 32% and 22% in total AGI Venting volumes).

**Costs:** Currently only internal resourcing required.

**Expected Timelines:** Learning from a successful DPLA Beta application will form part of the next phase of investigations.

**Stakeholder Engagement:** Engagement will primarily be through the Shrinkage Forum environment. Changes to AGI Venting methodology and any associated baseline impacts would require a SLM modification which would include a 28-day industry consultation exercise as specified within the Licence.

# Shrinkage Leakage Model Review

## Final Report

### Summary of Consultation

In the Joint GDN consultation document we highlighted our proposed commitments for shrinkage improvement in future years of the RIIO-2 period. These commitments are a combination of stakeholder introduced requirements and GDN identified opportunities.

The GDNs have reviewed the Centrica PLC representation and we conclude that the commitments documented below accurately reflect our areas of focus for the forthcoming period, we are pleased that the commitments are balanced between stakeholder instigated areas of focus and GDN identified projects. This reflects the value of the SLMR process and we encourage further participation from stakeholders in future years.

	New or Existing Project	Originator	Description
Digital Platform for Leakage Analytics	New	GDN	Innovation programme reviewing all controllable elements of fugitive emissions.
Shrinkage Profiling	New	Shipper	Reflecting seasonality and a daily Shrinkage profile in each year's emissions assessment.
Independent Shrinkage Expert	New	Shipper	Support the development of MOD0828R.
Own Use Gas review	Existing	Third Party	Continued investigation into the refreshment of the Own Use Gas methodology assumptions.
Pipe Remediation review	Existing	GDN	Modification to incorporate robotic mains remediation in the current Shrinkage Leakage Model methodology.
AGI Venting	Existing	GDN	Reviewing varying methods to quantify and forecast the extent and impact of AGI venting.

Finally, the GDN's would like to, once again, thank Centrica PLC for the consultation response. Your feedback on this process is valued and much welcome.

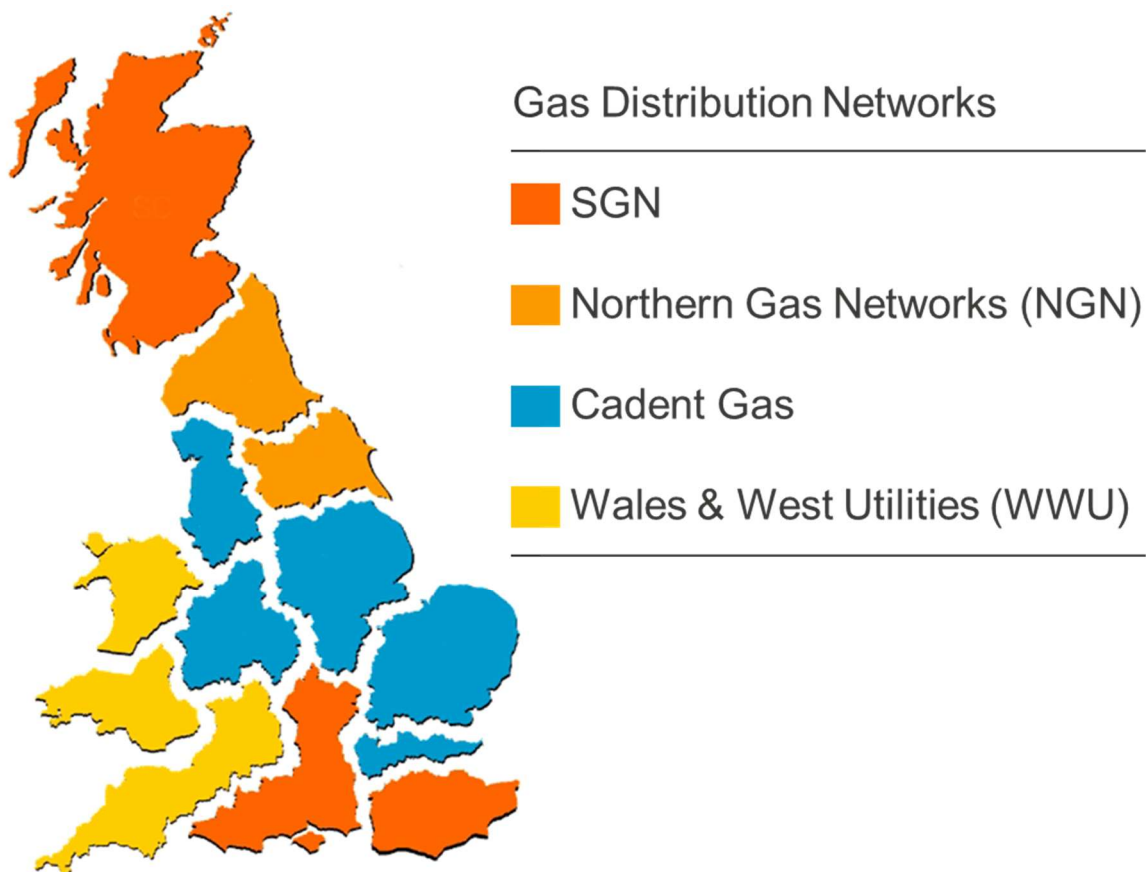
# Shrinkage Leakage Model Review

## Shrinkage Performance

### Supplementary Performance Breakdown

The performance breakdown contained within the following pages demonstrates component movement within each LDZ operational area. This additional information has been included as requested by Centrica PLC as part of the consultation process.

The network map below shows the geographic location of each network operator.

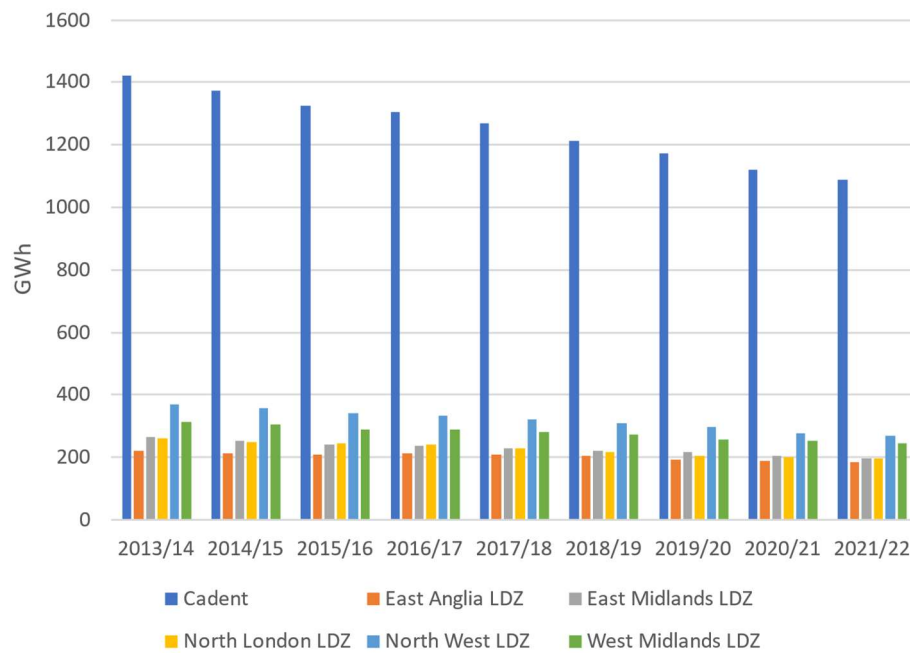


# Shrinkage Leakage Model Review

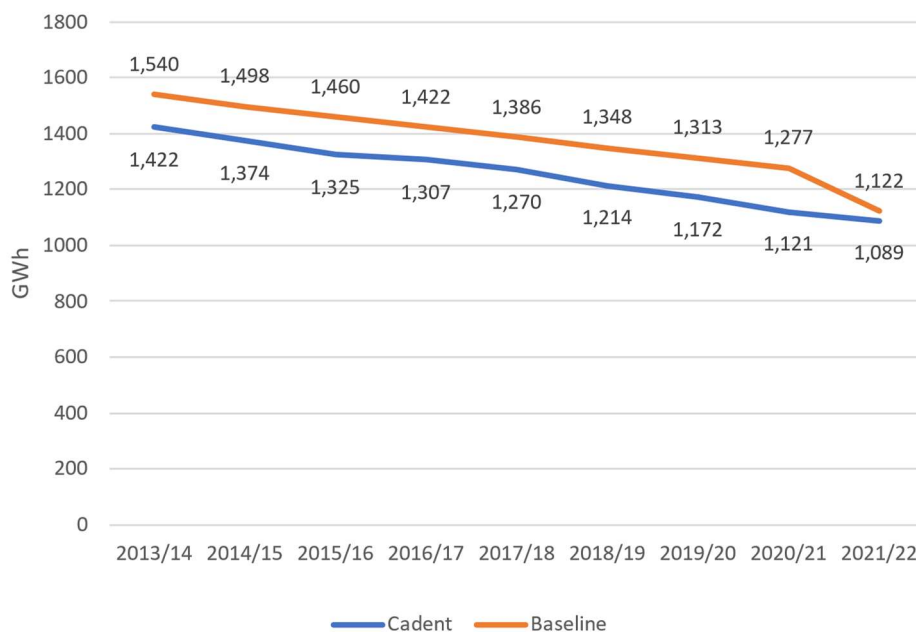
## Shrinkage Performance

### Cadent

Cadent Total LDZ Shrinkage



Cadent Total Network Shrinkage vs. Baseline Target



# Shrinkage Leakage Model Review

## Shrinkage Performance

### Cadent

#### Cadent Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	737.6 GWh 66%	System pressures increased by 0.1mb causing increased emissions. Low Pressure metallic mains length decreased by 1774km. MEG saturations decreased 1.2% Demand decreased by -0.8% impacting OUG and TOG by the same amount.	705.4 GWh 65%	-32.2 GWh -4.4%
MP Leakage	106.9 GWh 10%		106.6 GWh 10%	-0.3 GWh -0.3%
Other (AGI's, OUG, Theft & Interference)	276.5 GWh 25%		276.8 GWh 25%	0.3 GWh 0.1%
Total	1121 GWh 100%		1088.8 GWh 100%	-32.2 GWh -2.9%

#### East Anglia LDZ Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	120.9 GWh 64%	System pressures increased by 0.1mb causing increased emissions. Low Pressure metallic mains length decreased by 253.6km. MEG is not used within this LDZ Demand increased by 0% impacting OUG and TOG by the same amount.	115.6 GWh 63%	-5.3 GWh -4.4%
MP Leakage	14.6 GWh 8%		14.6 GWh 8%	0 GWh 0.0%
Other (AGI's, OUG, Theft & Interference)	53.2 GWh 28%		53.2 GWh 29%	0 GWh 0.0%
Total	188.7 GWh 100%		183.4 GWh 100%	-5.3 GWh -2.8%

#### East Midlands LDZ Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	106.4 GWh 52%	System pressures increased by 0.2mb causing increased emissions. Low Pressure metallic mains length decreased by 431.7km. MEG saturations decreased 0.5% Demand increased by 0% impacting OUG and TOG by the same amount.	99.6 GWh 51%	-6.8 GWh -6.4%
MP Leakage	39.3 GWh 19%		39.3 GWh 20%	0 GWh 0.0%
Other (AGI's, OUG, Theft & Interference)	57.8 GWh 28%		58.3 GWh 30%	0.5 GWh 0.9%
Total	203.5 GWh 100%		197.2 GWh 100%	-6.3 GWh -3.1%

# Shrinkage Leakage Model Review

## Shrinkage Performance

### Cadent

#### North London LDZ Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	135.3 GWh 68%	System pressures increased by 0.4mb causing increased emissions. Low Pressure metallic mains length decreased by 309.3km. MEG saturations decreased 1.6% Demand increased by 0% impacting OUG and TOG by the same amount.	131.1 GWh 67%	-4.2 GWh -3.1%
MP Leakage	19 GWh 10%		18.6 GWh 10%	-0.4 GWh -2.1%
Other (AGI's, OUG, Theft & Interference)	45.4 GWh 23%		45.3 GWh 23%	-0.1 GWh -0.2%
Total	199.7 GWh 100%		195 GWh 100%	-4.7 GWh -2.4%

#### North West LDZ Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	196.9 GWh 71%	System pressures decreased by 0.2mb causing decreased emissions. Low Pressure metallic mains length decreased by 475.3km. MEG saturations decreased 2.1% Demand decreased by -2.3% impacting OUG and TOG by the same amount.	186.7 GWh 70%	-10.2 GWh -5.2%
MP Leakage	14.4 GWh 5%		14.5 GWh 5%	0.1 GWh 0.7%
Other (AGI's, OUG, Theft & Interference)	67.1 GWh 24%		67.2 GWh 25%	0.1 GWh 0.1%
Total	278.4 GWh 100%		268.4 GWh 100%	-10 GWh -3.6%

#### West Midlands LDZ Network Performance

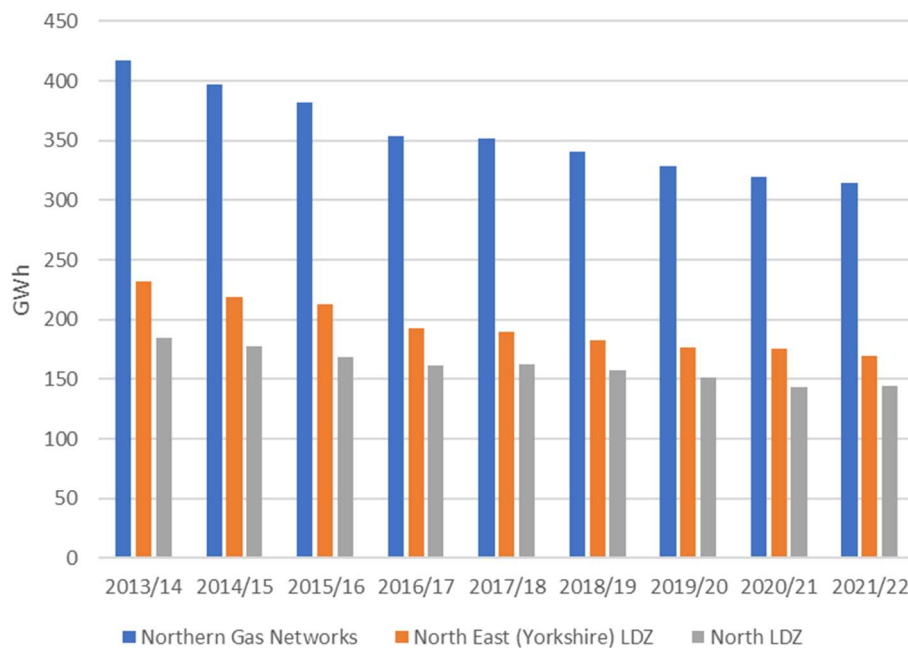
Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	178.1 GWh 71%	System pressures increased by 0.1mb causing increased emissions. Low Pressure metallic mains length decreased by 304km. MEG saturations decreased 0.2% Demand decreased by -1.4% impacting OUG and TOG by the same amount.	172.4 GWh 70%	-5.7 GWh -3.2%
MP Leakage	19.6 GWh 8%		19.6 GWh 8%	0 GWh 0.0%
Other (AGI's, OUG, Theft & Interference)	53 GWh 21%		52.8 GWh 22%	-0.2 GWh -0.4%
Total	250.7 GWh 100%		244.8 GWh 100%	-5.9 GWh -2.4%

# Shrinkage Leakage Model Review

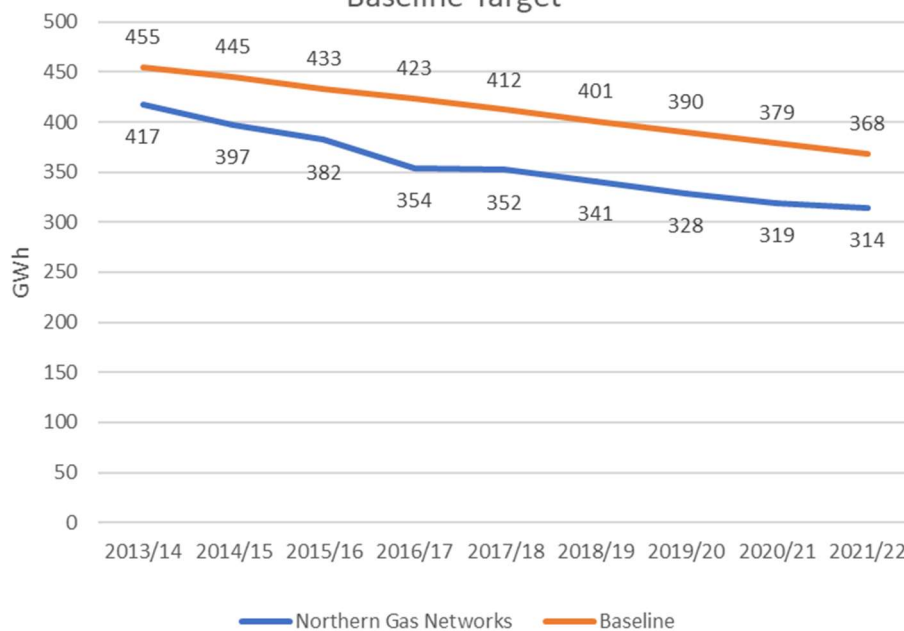
## Shrinkage Performance

### Northern Gas Network

Northern Gas Networks Total LDZ Shrinkage



Northern Gas Networks Total Network Shrinkage vs. Baseline Target



# Shrinkage Leakage Model Review

## Shrinkage Performance

### Northern Gas Network

Northern Gas Networks Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	212.1 GWh 66%	System pressures increased by 1.3mb causing increased emissions. Low Pressure metallic mains length decreased by 560.8km. MEG saturations decreased 4.1% Demand decreased by -5% impacting OUG and TOG by the same amount.	207.3 GWh 66%	-4.8 GWh -2.3%
MP Leakage	25 GWh 8%		25 GWh 8%	0 GWh 0.0%
Other (AGI's, OUG, Theft & Interference)	81.9 GWh 26%		81.7 GWh 26%	-0.2 GWh -0.2%
Total	319 GWh 100%		314 GWh 100%	-5 GWh -1.6%

North East (Yorkshire) LDZ Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	114.7 GWh 67%	System pressures increased by 1.7mb causing increased emissions. Low Pressure metallic mains length decreased by 291.1km. MEG saturations decreased 0.9% Demand decreased by -5.8% impacting OUG and TOG by the same amount.	112.6 GWh 66%	-2.1 GWh -1.8%
MP Leakage	16 GWh 9%		16.1 GWh 9%	0.1 GWh 0.6%
Other (AGI's, OUG, Theft & Interference)	41.4 GWh 24%		41.2 GWh 24%	-0.2 GWh -0.5%
Total	172.1 GWh 100%		169.9 GWh 100%	-2.2 GWh -1.3%

North LDZ Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	97.4 GWh 66%	System pressures increased by 0.8mb causing increased emissions. Low Pressure metallic mains length decreased by 269.7km. MEG saturations decreased 6.3% Demand decreased by -4% impacting OUG and TOG by the same amount.	94.7 GWh 66%	-2.7 GWh -2.8%
MP Leakage	9 GWh 6%		8.9 GWh 6%	-0.1 GWh -1.1%
Other (AGI's, OUG, Theft & Interference)	40.5 GWh 28%		40.5 GWh 28%	0 GWh 0.0%
Total	146.9 GWh 100%		144.1 GWh 100%	-2.8 GWh -1.9%

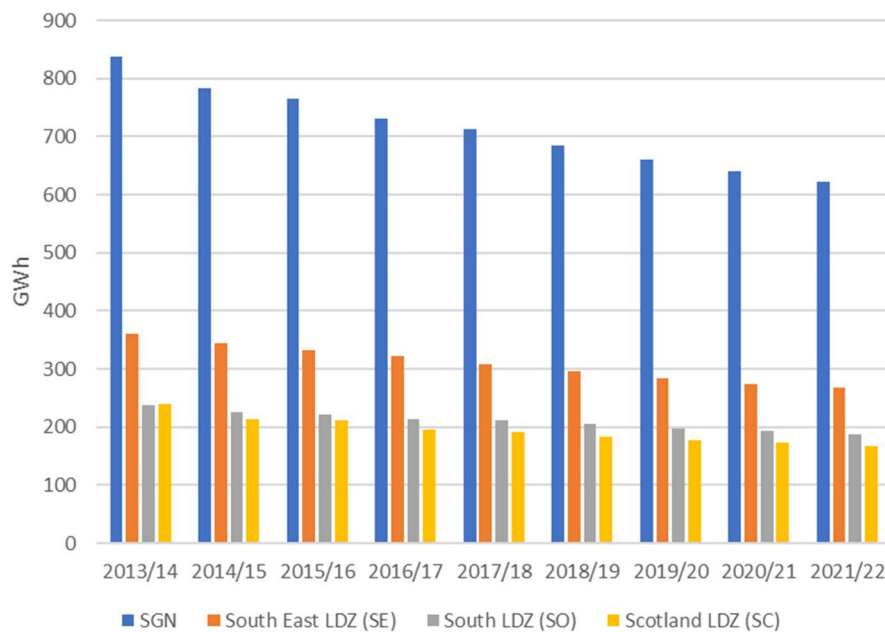


# Shrinkage Leakage Model Review

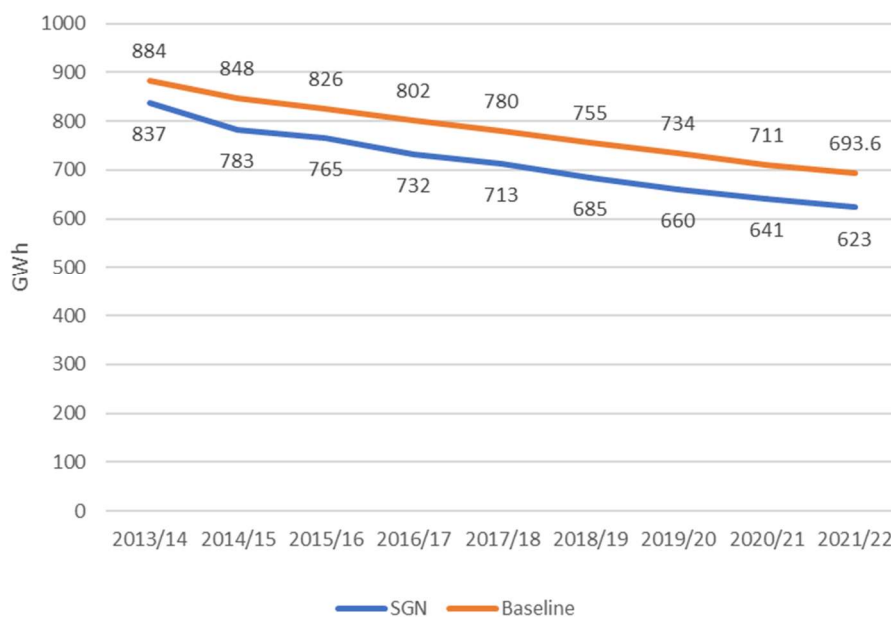
## Shrinkage Performance

### SGN

SGN Total LDZ Shrinkage



SGN Total Network Shrinkage vs. Baseline Target



# Shrinkage Leakage Model Review

## Shrinkage Performance

### SGN

#### SGN Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	443.2 GWh 69%	System pressures increased by 0.2mb causing increased emissions. Low Pressure metallic mains length decreased by 827.2km. MEG saturations increased 1% Demand decreased by -1.8% impacting OUG and TOG by the same amount.	428.3 GWh 69%	-14.9 GWh -3.4%
MP Leakage	55.8 GWh 9%		55.7 GWh 9%	-0.1 GWh -0.2%
Other (AGI's, OUG, Theft & Interference)	141.9 GWh 22%		139.4 GWh 22%	-2.5 GWh -1.8%
Total	640.9 GWh 100%		623.4 GWh 100%	-17.5 GWh -2.7%

#### South East LDZ (SE) Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	211.1 GWh 77%	System pressures increased by 0.4mb causing increased emissions. Low Pressure metallic mains length decreased by 384.2km. MEG saturations decreased 0.4% Demand increased by 1.8% impacting OUG and TOG by the same amount.	205.7 GWh 77%	-5.4 GWh -2.6%
MP Leakage	13.9 GWh 5%		13.8 GWh 5%	-0.1 GWh -0.7%
Other (AGI's, OUG, Theft & Interference)	48.5 GWh 18%		48.3 GWh 18%	-0.2 GWh -0.4%
Total	273.5 GWh 100%		267.8 GWh 100%	-5.7 GWh -2.1%

#### South LDZ (SO) Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	123.9 GWh 64%	System pressures increased by 0.1mb causing increased emissions. Low Pressure metallic mains length decreased by 206.3km. MEG saturations increased 0% Demand decreased by -1.6% impacting OUG and TOG by the same amount.	119.5 GWh 63%	-4.4 GWh -3.6%
MP Leakage	26.7 GWh 14%		26.6 GWh 14%	-0.1 GWh -0.4%
Other (AGI's, OUG, Theft & Interference)	43.4 GWh 22%		42.1 GWh 22%	-1.3 GWh -3.0%
Total	194 GWh 100%		188.2 GWh 100%	-5.8 GWh -3.0%

# Shrinkage Leakage Model Review

## Shrinkage Performance

### SGN

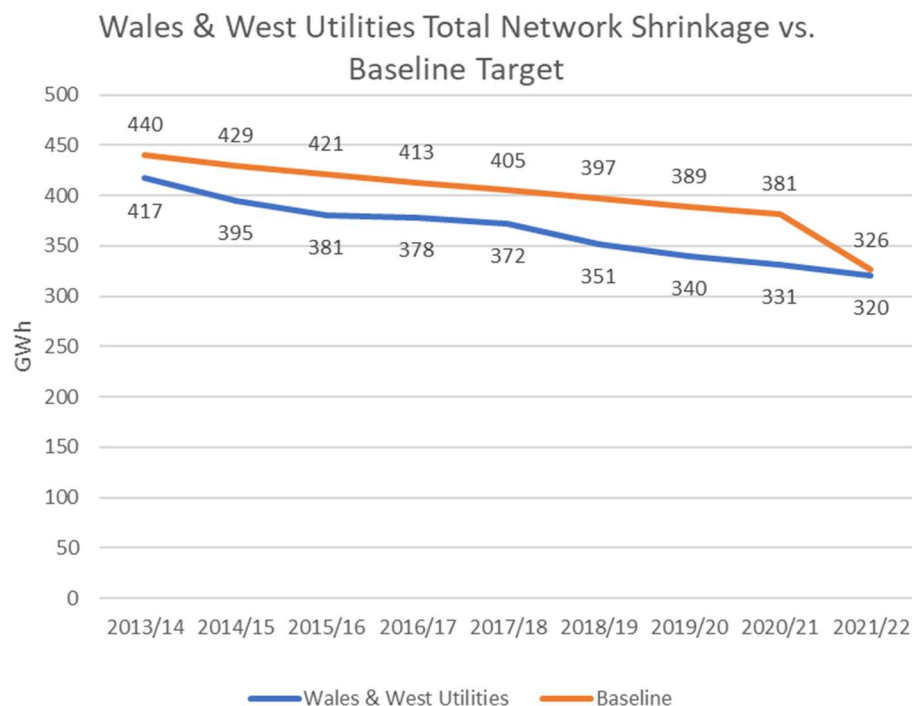
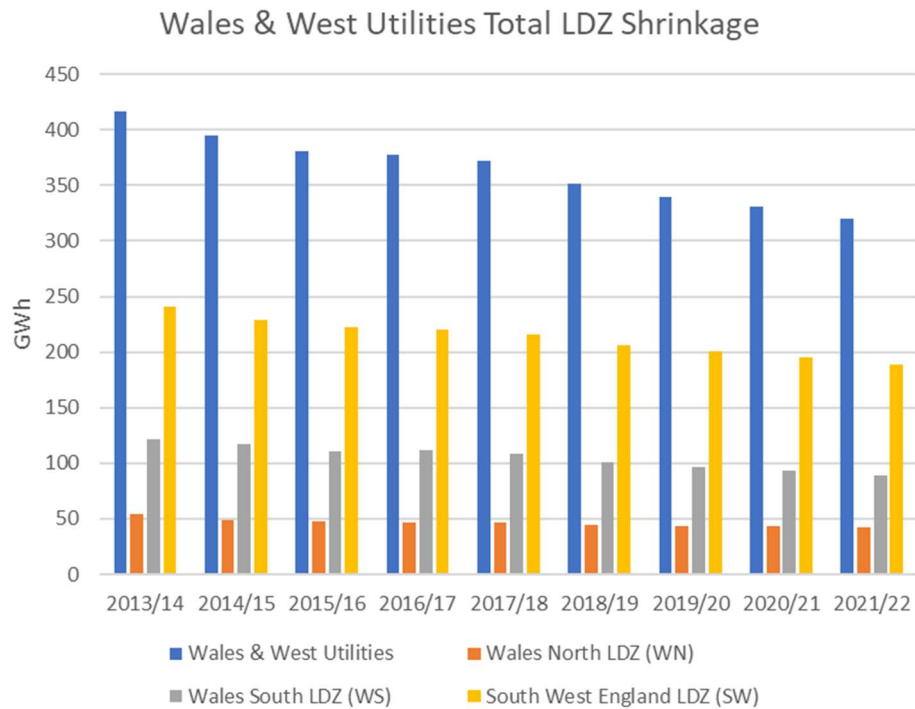
Scotland LDZ (SC) Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	108.2 GWh 62%	System pressures increased by 0mb causing increased emissions. Low Pressure metallic mains length decreased by 236.8km. MEG saturations increased 2.4% Demand decreased by -5.3% impacting OUG and TOG by the same amount.	103 GWh 62%	-5.2 GWh -4.8%
MP Leakage	15.2 GWh 9%		15.2 GWh 9%	0 GWh 0.0%
Other (AGI's, OUG, Theft & Interference)	50 GWh 29%		49.1 GWh 29%	-0.9 GWh -1.8%
Total	173.4 GWh 100%		167.3 GWh 100%	-6.1 GWh -3.5%

# Shrinkage Leakage Model Review

## Shrinkage Performance

### Wales & West Utilities



# Shrinkage Leakage Model Review

## Shrinkage Performance

### Wales & West Utilities

#### Wales & West Utilities Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	206.6 GWh 62%	System pressures decreased by 0.3mb causing decreased emissions. Low Pressure metallic mains length decreased by 318.4km. MEG is not used within this Distribution Network. Demand decreased by -4.8% impacting OUG and TOG by the same amount.	197.3 GWh 62%	-9.3 GWh -4.5%
MP Leakage	31.6 GWh 10%		30.9 GWh 10%	-0.7 GWh -2.2%
Other (AGI's, OUG, Theft & Interference)	92.7 GWh 28%		92.2 GWh 29%	-0.5 GWh -0.5%
Total	330.9 GWh 100%		320.4 GWh 100%	-10.5 GWh -3.2%

#### Wales North LDZ (WN) Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	16.8 GWh 39%	System pressures decreased by 0.3mb causing decreased emissions. Low Pressure metallic mains length decreased by 29.4km. MEG is not used within this LDZ Demand increased by 0% impacting OUG and TOG by the same amount.	16 GWh 38%	-0.8 GWh -4.8%
MP Leakage	3.5 GWh 8%		3.2 GWh 8%	-0.3 GWh -8.6%
Other (AGI's, OUG, Theft & Interference)	22.8 GWh 53%		23 GWh 55%	0.2 GWh 0.9%
Total	43.1 GWh 100%		42.2 GWh 100%	-0.9 GWh -2.1%

#### Wales South LDZ (WS) Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	53.7 GWh 58%	System pressures decreased by 0.3mb causing decreased emissions. Low Pressure metallic mains length decreased by 83.9km. MEG is not used within this LDZ Demand decreased by -8.3% impacting OUG and TOG by the same amount.	50.7 GWh 57%	-3 GWh -5.6%
MP Leakage	9.4 GWh 10%		9.2 GWh 10%	-0.2 GWh -2.1%
Other (AGI's, OUG, Theft & Interference)	29.9 GWh 32%		29.5 GWh 33%	-0.4 GWh -1.3%
Total	93 GWh 100%		89.4 GWh 100%	-3.6 GWh -3.9%

# Shrinkage Leakage Model Review

## Shrinkage Performance

### Wales & West Utilities

South West England LDZ (SW) Network Performance

Component	2020/21	Drivers of Change	2021/22	Difference
LP Leakage	136.1 GWh 70%	System pressures decreased by 0.3mb causing decreased emissions. Low Pressure metallic mains length decreased by 205km. MEG is not used within this LDZ Demand decreased by -3.1% impacting OUG and TOG by the same amount.	130.6 GWh 69%	-5.5 GWh -4.0%
MP Leakage	18.7 GWh 10%		18.5 GWh 10%	-0.2 GWh -1.1%
Other (AGI's, OUG, Theft & Interference)	40 GWh 21%		39.7 GWh 21%	-0.3 GWh -0.7%
Total	194.8 GWh 100%		188.8 GWh 100%	-6 GWh -3.1%

# Shrinkage Leakage Model Review

## Modelling Consistency

### SLM Methodology Rules

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**GDNs ensure reporting consistency by a combination of applying the approved consistent SLM methodology and through regular Joint GDN workgroup sessions. This methodology is applied as part of the regulatory reporting process. GDNs adhere to rigorous Data Assurance Guidelines (DAG) procedures which require strict internal approval processes.**

The procurement, processing, and validation of this large volume of data results in lead times of approximately 4 months each year (April-July) to produce the final Leakage and Shrinkage figures. These are subject to detailed internal scrutiny and formal approval processes prior to being sent to Ofgem as part of the GDN's Regulatory Reporting Pack (RRP) and is used to compile the annual Assessment and Adjustment Report published at the end of July.

All GDNs use the following assumptions to complete the SLM. These are approved by OFGEM and listed below. GDNs have previously undertaken multiple workshops to ensure a consistent approach is taken to applying the below methodology.

1. Own Use Gas quantities calculated as 0.0113% of annual consumption.
2. Theft of Gas quantities calculated as 0.020% of annual consumption.
3. Low Pressure leakage rates are categorised by material and diameter type as directed in the National Leakage Test. Leakage rates for Low Pressure mains increase or decrease dependant on the localised average system pressure.
  - a. PE 63.5 cu.m/annum/km at 30mb system pressure
  - b. Steel 3,416.3 – 3,854.3 cu.m/annum/km at 30mb system pressure
  - c. Ductile Iron 576.4 – 719.2 cu.m/annum/km at 30mb system pressure
  - d. Pit Cast 1639.8 – 7,463.4 cu.m/annum/km at 30mb system pressure
  - e. Spun Cast 1,075.7 cu.m/annum/km at 30mb system pressure
4. Medium Pressure leakage rates are derived from those used for LP Mains Leakage – Leakage tests were carried out on LP assets with no provision made for MP so actual figures are unknown.
5. Medium Pressure average system pressure is always assumed to be 30mbar – no provision is made within the approved SLM for calculating leakage volume based on MP average system pressure.

# Shrinkage Leakage Model Review

## Modelling Consistency

### SLM Methodology Rules

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6. AGI Leakage rates are split into 5 categories with a Leakage rate applied to each category:
  - a. Holder Station: 7,692 m<sup>3</sup>/year/site
  - b. NTS Offtake: 31,075 m<sup>3</sup>/year/site
  - c. Local Transmission: 6,485 m<sup>3</sup>/year/site
  - d. District Governor: 407 m<sup>3</sup>/year/site
  - e. Service Governor: 8 m<sup>3</sup>/year/site
7. AGI Venting rates are specified for each LDZ and remain static.
8. Interference Damage Mains >500kg incidents:
  - a. Emissions use a flat rate of 500kg per incident.
9. Interference Damage to mains <500kg incidents, the quantity of incidents are split by the following ratios:
  - a. LP Incidents: 95%, leakage rate 42.45m<sup>3</sup>/hr (response time of 3.92 hours),
  - b. MP Incidents: 5%, leakage rate 283m<sup>3</sup>/hr (response time of 3.92hours).
10. Interference Damage to services: These are calculated using a set of assumptions (once the number of incidents has been determined). The first is that the incidents are split 50:50 between severing of service and puncturing of service, both of which have a different set leakage rate.
  - a. Severed service – 17m<sup>3</sup>/hr (response time 2hrs),
  - b. Punctured service – 5.6m<sup>3</sup>/hr (response time 2hrs).
11. Percentage of Pit Cast population that is Lead Yarn Jointed is 88.5%. Percentage of Spun Cast population that is Lead Yarn Jointed is 18.5%.
12. MEG saturations and Net Leakage impact follow an exponential pattern, so for a known saturation you could calculate Net Leakage benefit using the following exponential calculation: Net Leakage benefit =  $\exp(-0.899 * \text{Saturation})$ .