



UAGCVS Report

November 2022

Executive Summary

This report provides a review of National Grid Gas's (NGG) Unaccounted for Gas (UAG) management since April 2013, the start of the RIIO-T1 price control, with particular emphasis on 1st April 2022 to 30th September 2022 inclusive, the period since the publication of the May 2022 UAGCVS report.

This report also contains our Calorific Value Shrinkage (CVS) statement with an overview of its possible causes. The publication of this report discharges NGG obligations under the Gas Transporter Licence Part J of Special Condition 5.6 (System operator external incentives, revenues and costs) – requirement to undertake work to investigate the causes of UAG and CVS.

The total assessed UAG quantity for the 1st April 2022 to 30th September 2022 period is greater than the previous six-month period. Monthly assessed UAG is also greater than the long-term average (April 2013 to September 2022) for all of the last 6 months, which is not in line with summer throughput behaviour. Metering error has been instrumental in UAG trends over this period.

NGG continue to improve its understanding of the causes of UAG through the use of data visualisation tools and investigative projects.

CV Shrinkage has increased in the summer period of Formula Year 2022/23 when compared to the same months in the previous year. CV Capping has continued to contribute towards the increase which has predominately been witnessed in NE, SC and NO LDZs.

Continued support from meter owners has enabled NGG to obtain and review meter validation information for NTS entry and exit facilities. This data is being used to support the identification of causes of UAG, to enhance NGG's ability to detect meter error and to inform the preparation of future meter witnessing programmes.

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Unaccounted for Gas & Calorific Value Shrinkage Report – November 2022

Introduction

This report provides a review of NGG's UAG and CVS management.

The report provides information on assessed UAG quantities since April 2013, the start of the RIIO-T1 price control, with particular emphasis on 1st April to 30th September 2022 inclusive, the period since the publication of the May 2022 UAG report. It describes NGG's endeavours to undertake projects for the purposes of investigating the causes of UAG and CVS.

UAG, CVS and OUG (Own Use Gas) are the three components of NTS Shrinkage. Further information on the components of NTS Shrinkage can be found via the following link:

[NGG - UAG Management](#)

To compliment this report, NGG also provides a range of UAG related data including:

- previous UAG reports and UAGCVS reports
- daily data on the components of NTS Shrinkage

which are available on the NGG website via the above link.

For additional information on the components of Shrinkage, please refer to the following link:

[NGG - Shrinkage](#)

The publication of this report and associated backing data discharges NGG's obligations under the Gas Transporter Licence Part J of Special Condition 5.6 (System operator external incentives, revenues and costs) - Requirement to undertake work to investigate the causes of UAG and CVS. Part J of Special Licence Condition 5.6 – requirement to undertake work to investigate the causes of UAG and CVS which is detailed in Appendix I of the report.

If you have any feedback or questions on this document, please contact NGG's Meter Assurance team via the following email address:

meterassurance@nationalgrid.com.

The Meter Assurance Team are part of the Energy Balancing team within NGG and are responsible for investigating the causes of and reporting upon UAG and CVS.

National Transmission System Unaccounted for Gas Trends

This section of the report provides information on assessed UAG quantities since April 2013, with particular emphasis on the period 1st April 2022 to 30th September 2022.

Unless stated otherwise, all UAG values are Pre-Reconciliation UAG. Pre-Reconciliation UAG is the value which is recorded after entry and exit closeout. This data shows the position prior to any reconciliations taking place.

Formula Years 2013/14 to 2022/23 (so far)

Figure 1 provides the annual assessed UAG, OUG and CVS quantities for Formula Years 2013/14 to 2022/23 (so far). A Formula Year refers to the period from 1st April to 31st March of the following year.

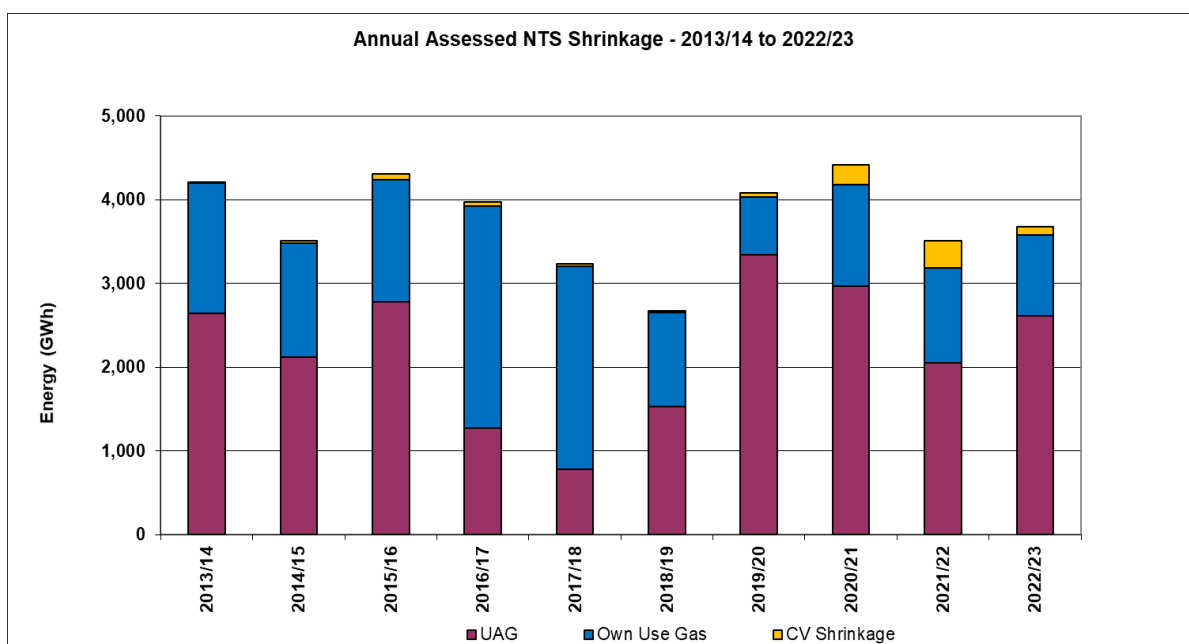


Figure 1: Annual assessed NTS Shrinkage – 2013/14 to 2022/23
 *2022/23 includes months April 2022 to September 2022

Figure 1 demonstrates that for Formula Year 2022/23 so far, NTS Shrinkage is already high. There are known Distribution Network meter errors for Thornton Curtis Offtake and Royston Offtake which have significantly impacted UAG throughout these months, these errors will be reconciled in due course, and we expect this reconciliation to significantly reduce the levels of pre reconciliation UAG reported here. UAG continues to be the predominant component, currently making up 71% of NTS Shrinkage, OUG makes up 26% and CVS 3%. CVS became more prominent over the last few years and the potential causes of this will be explored in more detail later in the report.

Figure 2 provides the summer period assessed UAG, OUG and CVS comprising of April to September data for each Formula Year.

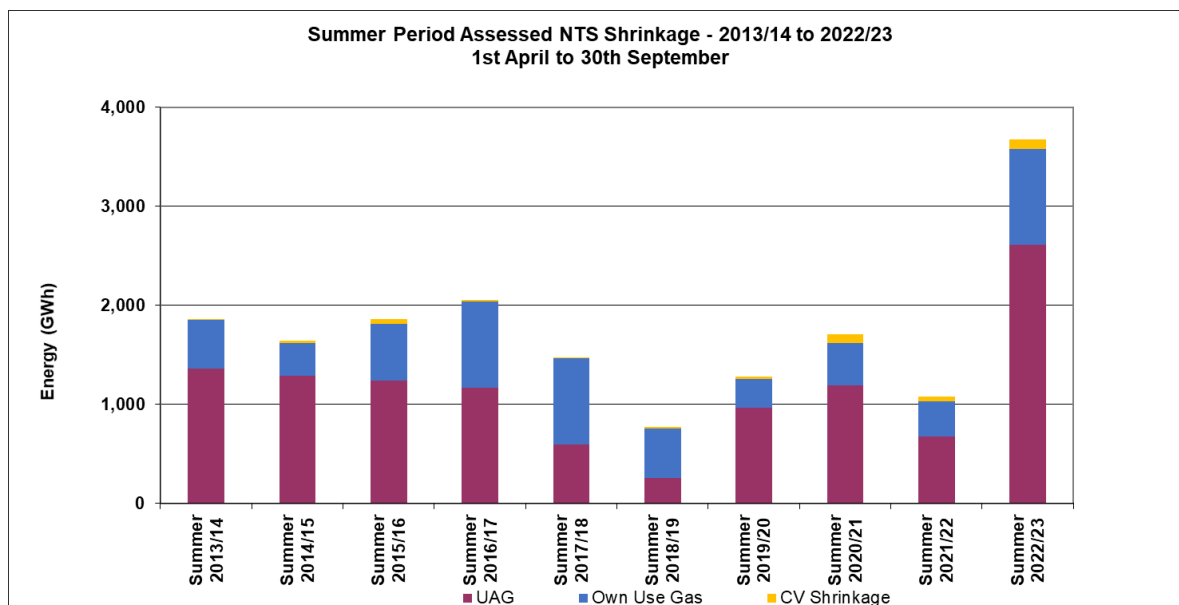


Figure 2: Summer Period Assessed NTS Shrinkage – 2013/14 to 2022/23

Figure 2 demonstrates that NTS Shrinkage throughout this summer period (April to September) has been much higher than the previous periods. UAG has seen a predominant increase, mostly due to a known Distribution Network meter error from April to July 2022, although OUG has also risen throughout this period due to increased compressor usage because of this summer's increased throughput. Exports to the EU have increased throughout this summer period which would also have some impact on UAG levels. CVS is similar to the values we have witnessed over the past 3 years.

UAG over this period equates to 2611 GWh, which is 287% higher than last year's summer period. There has been an increased number of high positive UAG days, which included 72 instances that exceeded the ± 20 GWh tolerance and a 50% decrease in the number of days where negative UAG was also observed, when compared to the same period last year.

Total OUG quantities have also increased in comparison to the previous year's summer period, with an increase of 169%.

CVS is 91% greater than last year's summer period, although the values for CVS are small in comparison to OUG and UAG, further information on CVS can be found in the CVS Statement within this report.

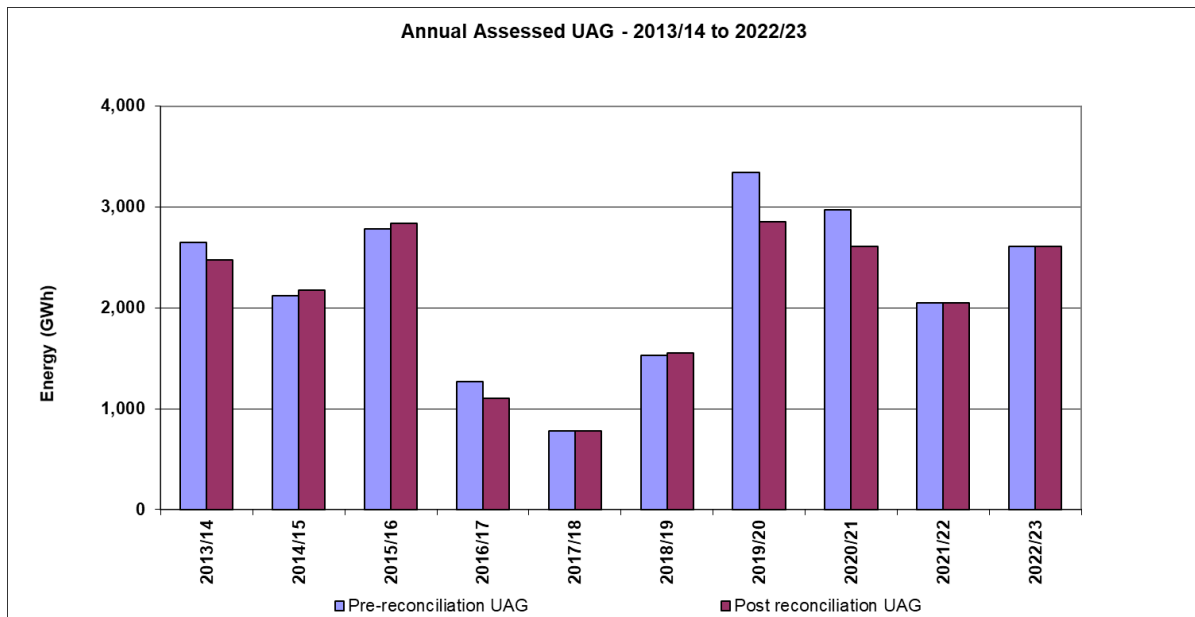


Figure 3: Annual assessed UAG – 2013/14 to 2022/23
 *2022/23 includes months April 2022 to September 2022

Figure 3 represents both Pre-Reconciliation and Post-Reconciliation annual assessed UAG quantities for Formula Years 2013/14 to 2022/23. Pre-Reconciliation UAG is calculated using the energy measurements reported in the Gemini commercial system at closeout for the NTS entry and exit points. If a meter or data error is identified outside of entry and exit closeout for one of these points, the correct measurements are determined. Post-Reconciliation UAG is then calculated using the corrected measurements. Further information on reconciliation is provided under section ‘UAG Management Activities’ of this report.

Table 1 provides the annual and daily average assessed UAG quantities for Formula Years 2013/14 to 2022/23. The table also provides the annual assessed UAG quantities as a percentage of annual NTS Throughput.

UAG	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Assessed Level (GWh)	2,648	2,121	2,782	1,272	783	1,528	3,342	2,972	2,051	2,611
Assessed Daily Average (GWh/d)	7.25	5.81	7.60	3.48	2.14	4.19	9.13	8.14	5.62	14.27
Percentage of NTS Throughput	0.30	0.24	0.30	0.13	0.08	0.17	0.36	0.32	0.23	0.57

Table 1: Statistical performance of UAG - 2013/14 to 2022/23
 *2022/23 includes months April 2022 to September 2022

The values provided in Table 1 indicate that annual assessed UAG, assessed daily average UAG and percentage of annual throughput in 2022/23 so far, are higher than the previous years, with percentage of NTS throughput values being the highest seen across all Formula Years due to the known Distribution Network meter error.

With a known large Distribution Network meter error identified in the 2022/23 summer period, the decreasing trend of UAG as a % of NTS Throughput since 2019/20 has ceased, a second meter error has also recently been identified, the error covers the period between October 2021 and October 2022. Throughput has increased over this summer period due to larger interconnector flows into Europe. An increase in throughput would also indicate a rise in UAG over this period, as UAG typically follows the rise and fall in throughput as seen in previous seasonal trends.

Figure 4 shows the total monthly assessed UAG from April 2013 to September 2022. It also provides the average monthly assessed UAG for this Formula Year (217.61 GWh) represented as the horizontal black line, together with the long-term average assessed UAG for the entire period (193.72 GWh) depicted as a dotted red line.

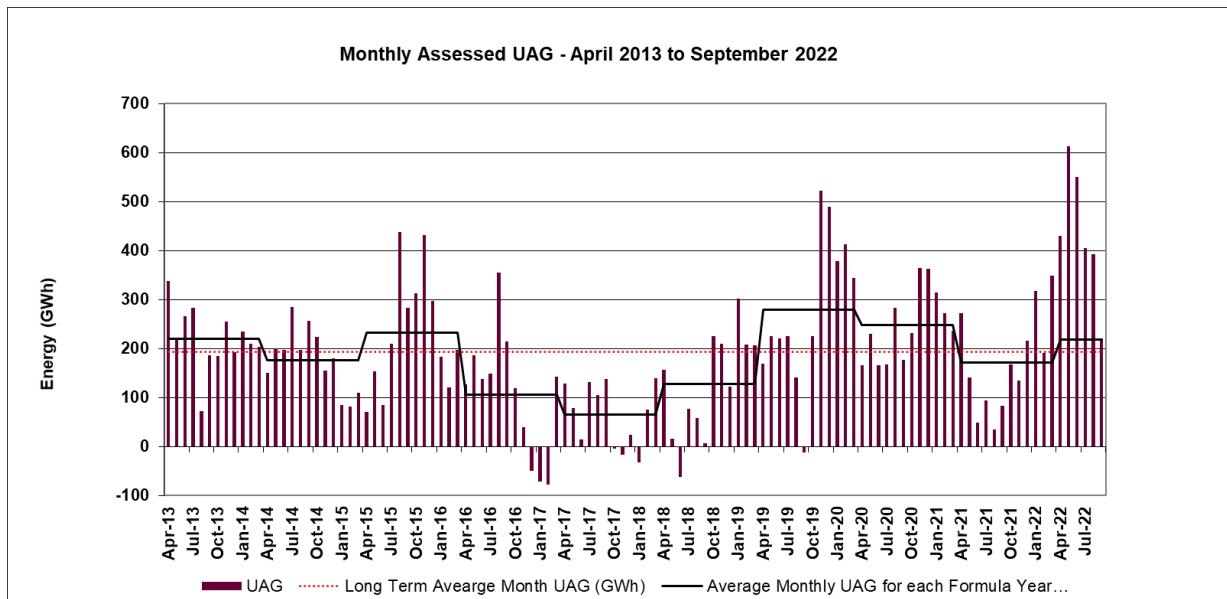


Figure 4: Monthly assessed UAG - April 2013 to September 2023

So far throughout 2022/23, all six months are above the Monthly Average and the same six months are also above the Long Term Monthly Average UAG. The last summer period had only one month that went above the Monthly Average.

Figure 5 provides the total monthly assessed UAG for April 2022 to September 2022, compared with the equivalent months within 2020/21. This highlights that there has been a large increase in monthly assessed UAG in all of the last six months.

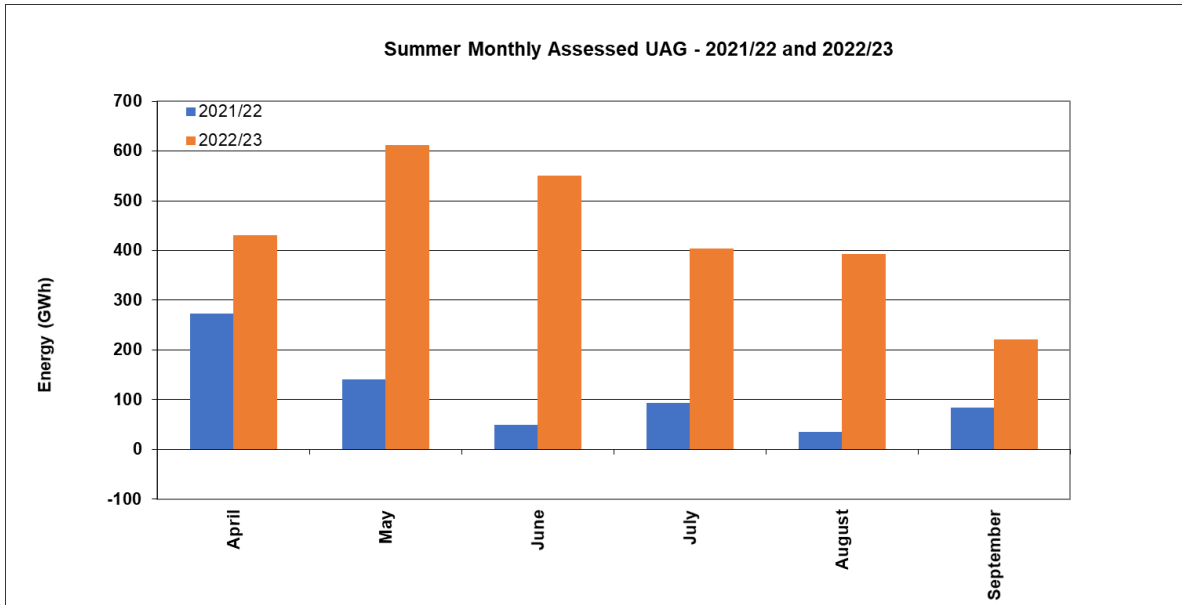


Figure 5: Summer Monthly Assessed UAG – April 2021 to September 2021 and April 2022 to September 2022

As seen in Figure 5 during the last six months the total monthly assessed UAG varied from +220.29 GWh to +612.30 GWh, with a monthly average of 435.22 GWh. These values are much higher when compared to the same months in the previous year. During April 2021 to September 2021, total monthly assessed UAG varied from +34.30 GWh to +272.72 GWh with a lower monthly average of 112.35 GWh.

Figure 6 shows the daily assessed UAG values for the period between 1st April 2022 and September 2022 and indicates that UAG has been outside ± 20 GWh for 61% of that time. Volatility between days has been observed and is depicted by a fluctuation of high positive to low negative or low negative to high positive UAG throughout the period. The rolling 30-day average illustrates the period of the known meter error at the Thornton Curtis Distribution Network Offtake and has a positive position throughout the period, with an average of 14.7 GWh/d.

NGG reviews and investigates the assessed UAG values on a daily basis paying particular attention to any values that exceed ± 20 GWh. These baseline UAG quantities are provided as red dotted lines in the above figure. During the period of April 2022 to September 2022 there were 72 days when daily assessed UAG exceeded ± 20 GWh. This is a 500% increase in high UAG days compared to the same period in 2021/22 when only

12 days exceeded ± 20 GWh. From the 72 high UAG days observed, the known meter errors are expected to have a significant impact on these values.

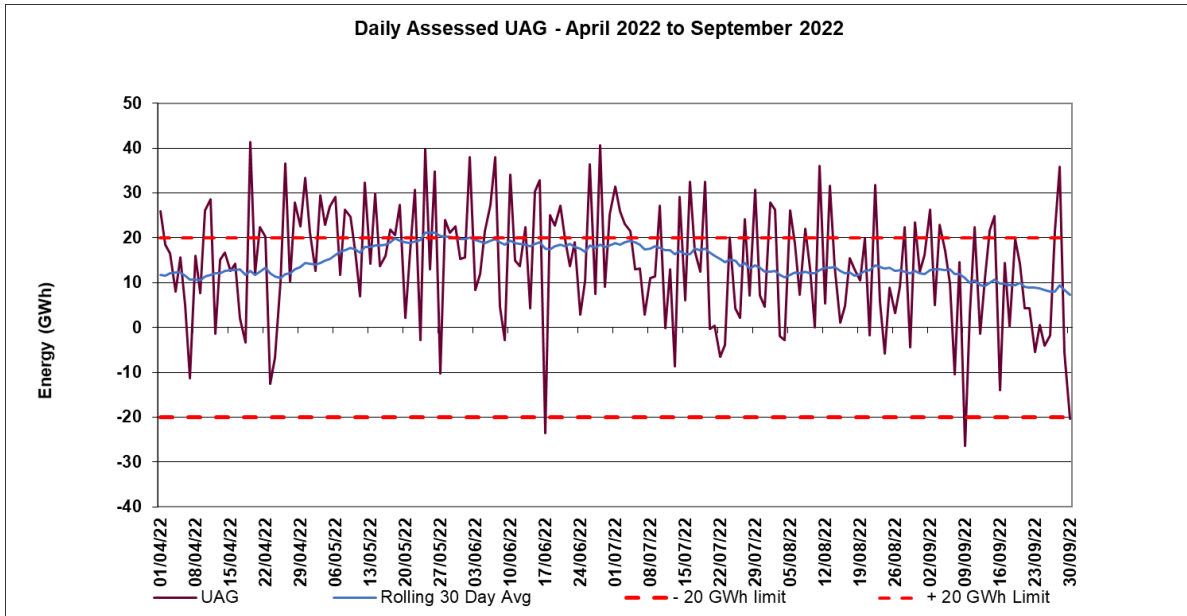


Figure 6: Summer Daily assessed UAG – April 2022 to September 2022

Whilst NGG have not yet quantified any causation of UAG, the meter errors that are due to be investigated by independent technical experts will assist in the identification of UAG over this period.

Figure 7 outlines the demand breakdown with UAG overlaid for the period between April 2018 to September 2022. Interconnector Export volumes have increased throughout the last 6 months, demonstrating a 382% rise in export flows when compared to the same 6 months in 2021. LDZ Offtakes display a seasonal pattern throughout, whereas Industrial and Power Station demand demonstrates a more consistent annual offtake.

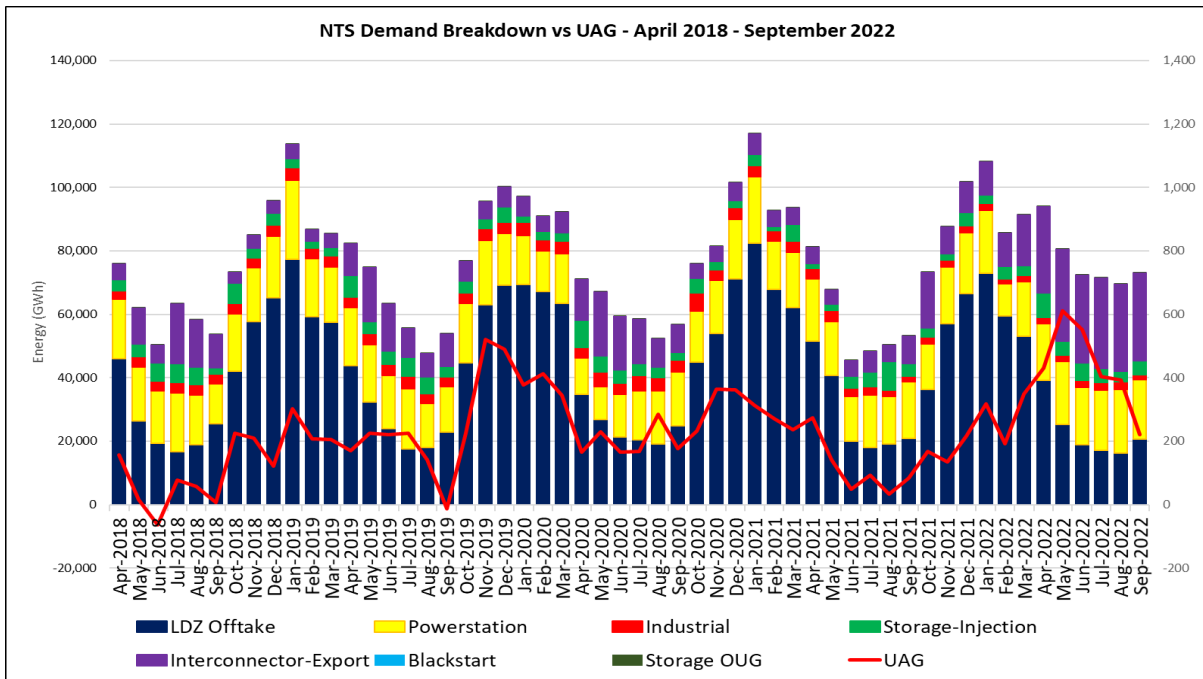


Figure 7: NTS demand breakdown – April 2018 to September 2022

Figure 8 below demonstrates the increases in monthly Interconnector Export volumes that have been observed since October 2021 with significant increases over the last 6 months.

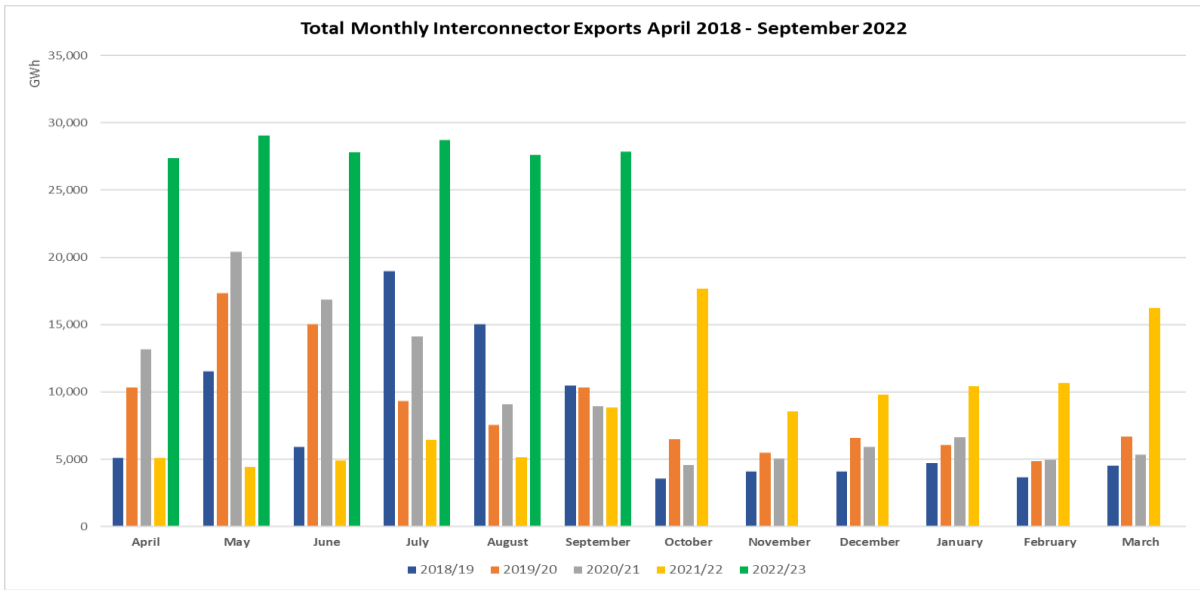


Figure 8: Interconnector Export April 2018 to September 2022

Figure 9 illustrates that Entry Terminals and LNG deliveries have continued in line with the seasonal patterns. Interconnector Imports have not been as prominent over the last 12 months compared to previous years due to the increased supply to Europe.

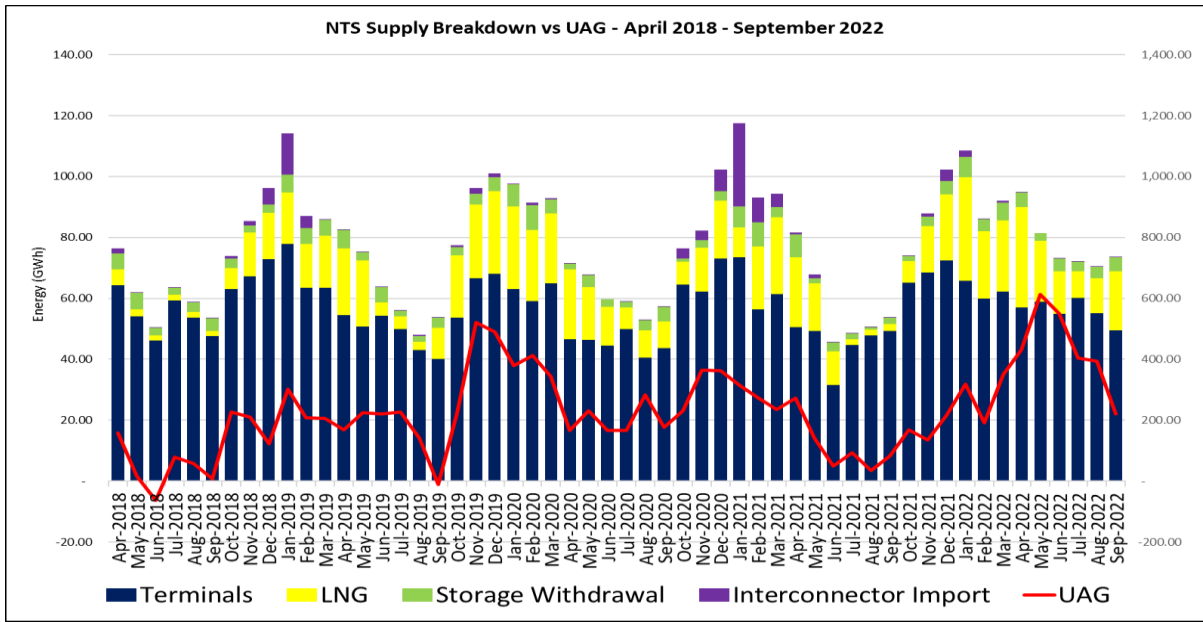


Figure 9: NTS supply breakdown – April 2018 to September 2022

Figure 10 provides the total LNG breakdown including South Hook and Dragon from Milford Haven in South Wales and both Isle of Grain Terminals in the South-East.

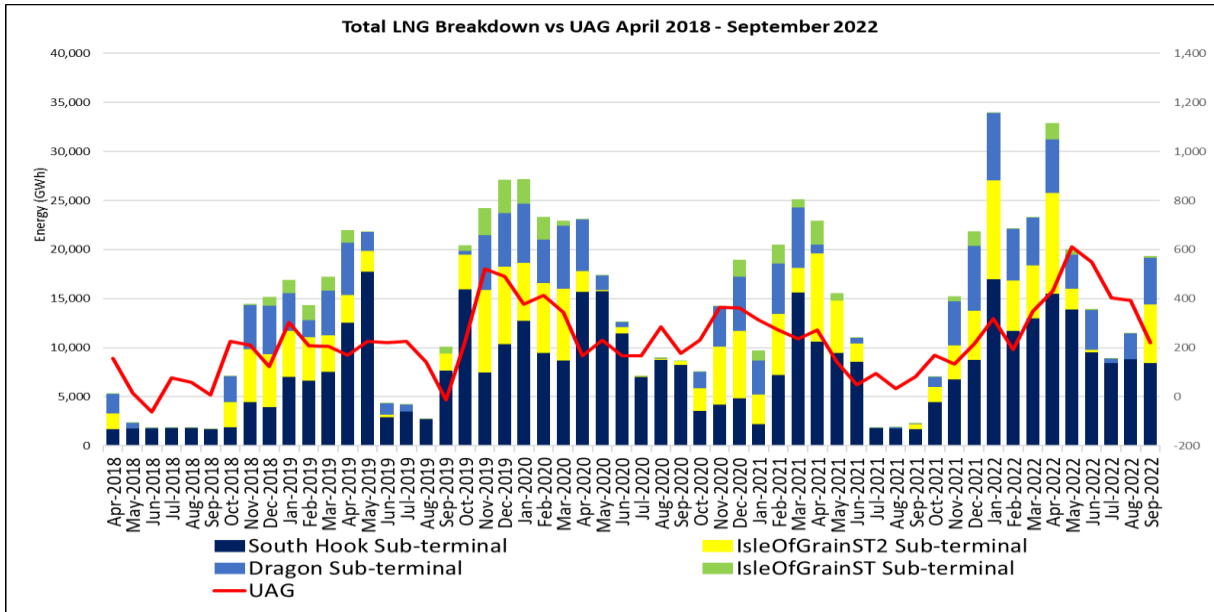


Figure 10: Total LNG breakdown – April 2018 to September 2022

As previously reported, UAG has increased and decreased with LNG flows but so far, there has been no evidence to determine that LNG flows are causing this UAG behaviour, which also broadly align to seasonal throughput trends.

Figure 11 below compares the total monthly LNG Imports since April 2018 and highlights the change in flow patterns that have been observed.

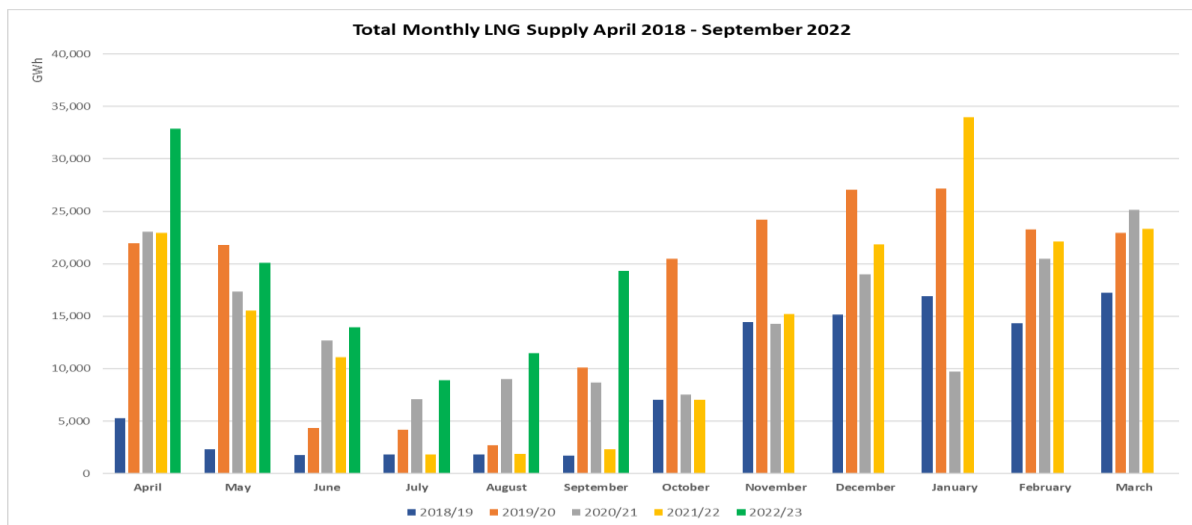


Figure 11: LNG Supply – April 2018 to September 2022

Figure 11 highlights that January 2022 had the greatest levels of LNG delivered onto the NTS, followed by April 2022. Over the last 6 months, LNG flows have been at larger quantities than the same months over previous years.

The relationship between UAG and LNG has previously been analysed and no significant correlation has been identified. NGG are looking to explore temperatures of gas being delivered onto the NTS and how that could impact volumetric measurements. Progress of this investigation will be shared in future UAGCVS Reports.

Figure 12 displays the monthly net Interconnector position for BBL, Interconnector (UK) and Moffat over the period between April 2016 and September 2022. The positive values on the graph show the monthly net position being Interconnector gas imports and the negative values show the monthly net position value being Interconnector gas exports. This graph demonstrates that UAG does not follow a pattern to net Interconnector activity although the last 6 months has seen higher UAG for this time of year when there has been increased exports.

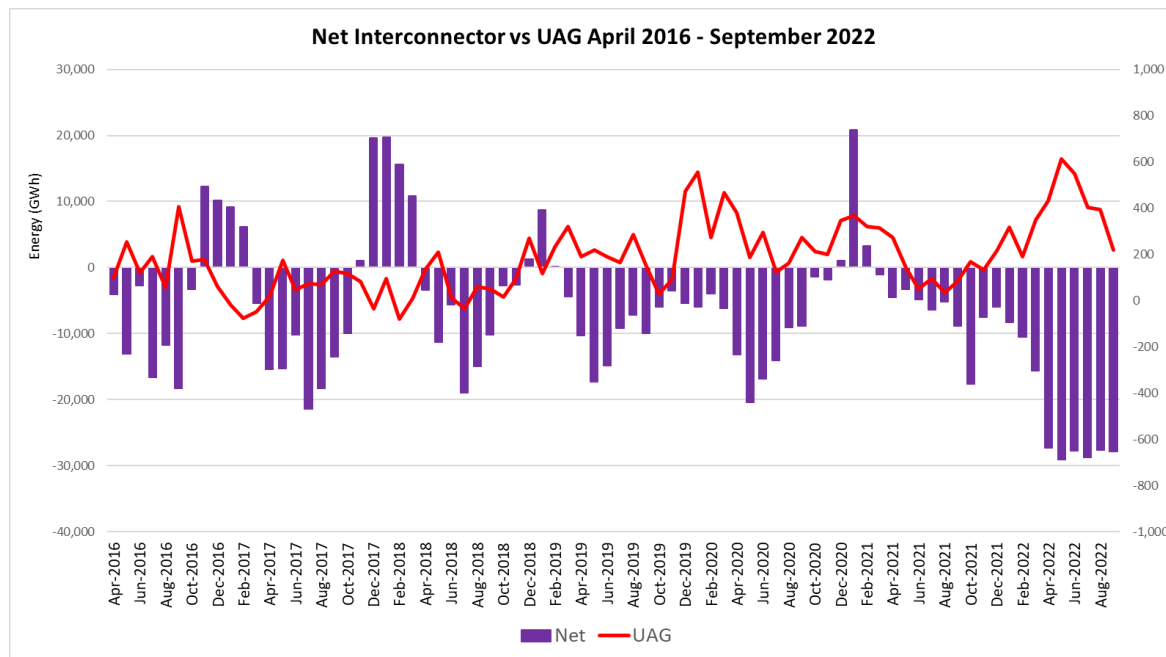


Figure 12: Net Interconnector – April 2016 to September 2022

The Interconnectors on the NTS operate under the “Allocate as Nominated” regime. Therefore, daily Interconnector values are determined by the commercial nomination rather than the physical measurement recorded by the fiscal metering on site. This differs from other site types on the NTS and as a result, Interconnectors have an Operational Balancing Account (OBA) which allows them to operate within a 0.3 mcm/d tolerance due to the potential differences between the commercial nomination and the physical measurement which is known as the Cumulative Steering Difference. The cumulative impact does not impact Shrinkage costs as over time the cumulative steering difference nets off, however, on a daily basis, it can cause spikes in UAG which could mask a real meter error. NGG are considering how daily OBA is currently incorporated into the UAG calculation.

Meter Error is still deemed to be the main cause of UAG. As previously reported, a significant meter error notification was submitted to the Joint Office by Cadent following the identification of a large meter error at Alrewas EM NTS to LDZ Offtake impacting gas days May 2019 to February 2021. The Meter Error Report has been made publicly available on the Joint Office of Gas Transporters, and the corrected invoice values were issued to EM LDZ Shippers in September 2022.

A second significant meter error has since been identified in EM LDZ Offtake impacting gas days between April & July. Two Independent Technical Experts (ITE’s) are currently analysing the meter error and will issue a report in due course containing the magnitude of the error.

UAG Management Activities

This section of the UAG report describes the various activities and initiatives that NGG has been undertaking or is planning to undertake to investigate the causes of UAG.

Meter Validation Report Reviews

Meter owners are obliged to undertake meter validations for each of their metering installations on at least an annual basis to confirm that the metering equipment is measuring correctly. The results of these tests are documented within a meter validation report and provided to NGG as soon as possible after the completion of the validation.

The validation reports provide essential information that allows NGG to assess the asset health and accuracy of the metering connected to its network. This enables a better understanding of the impact that meter error will have on assessed UAG.

For Formula Year 2022/23 NGG has so far received meter validation reports for 65 NTS entry and exit facilities, these reports are for validations that have taken place between April 2022 and September 2022.

From the validation reports that the Meter Assurance team have reviewed so far, NGG have raised queries where necessary with all relevant meter owners, to confirm if any instruments that tested outside of tolerance would have introduced measurement error, thus impacting assessed UAG levels.

The Meter Assurance team will continue to work with NTS Asset owners to review the Meter Validation Reports and close out any open actions that have arisen from the 2022/23 review period. The data provided and results recorded will be used to develop the meter witnessing programme for 2023/24.

During meter validation tests, the metering system is required to be intercepted in order to simulate and record values which entails disconnecting or overwriting physical instruments, wires and software. There is a risk that meter error could be introduced through these activities. NGG is continuing to investigate the potential to identify assessed UAG when meter validations are known to be taking place.

NGG is focussing on validation tests that have the potential to cause significant measurement error, to gain a better understanding of different calibration equipment and different tolerances. The asset owners are assisting with our queries associated to these tests.

Meter Witnessing

The purpose of witnessing the validations is to gain assurance that the measurement equipment within the metering installation continues to measure the gas delivered to or taken from the NTS without bias and within the agreed measurement uncertainties.

Witnessing involves NGG personnel attending metering installations throughout the UK during meter validations to observe and document the testing taking place. Since April 2022, NGG has developed a witnessing programme for this formula year and are engaging with NTS asset owners to arrange these visits.

Reconciliation

NGG has an obligation to reconcile NTS related meter and data errors on behalf of the shipping community.

Over the last six months, since the publication of the April 2022 UAG Report, NGG has adjusted 815.84 GWh in absolute energy terms via the reconciliation process. This comprises of 14 instances of reconciliation at individual NTS entry and exit facilities, each instance comprising of one or more days of reconciliation for a total of 620 gas days. The majority of these reconciliations have been in Formula Year 2021/22; however, reconciliations have also been processed for 2019/20 and 2022/23.

Figure 13 provides the annual reconciliation quantities, in absolute energy terms, for 2013/14 to 2021/22. The orange portion of the bars indicate the reconciliation quantities processed since the publication of the April 2022 UAG report.

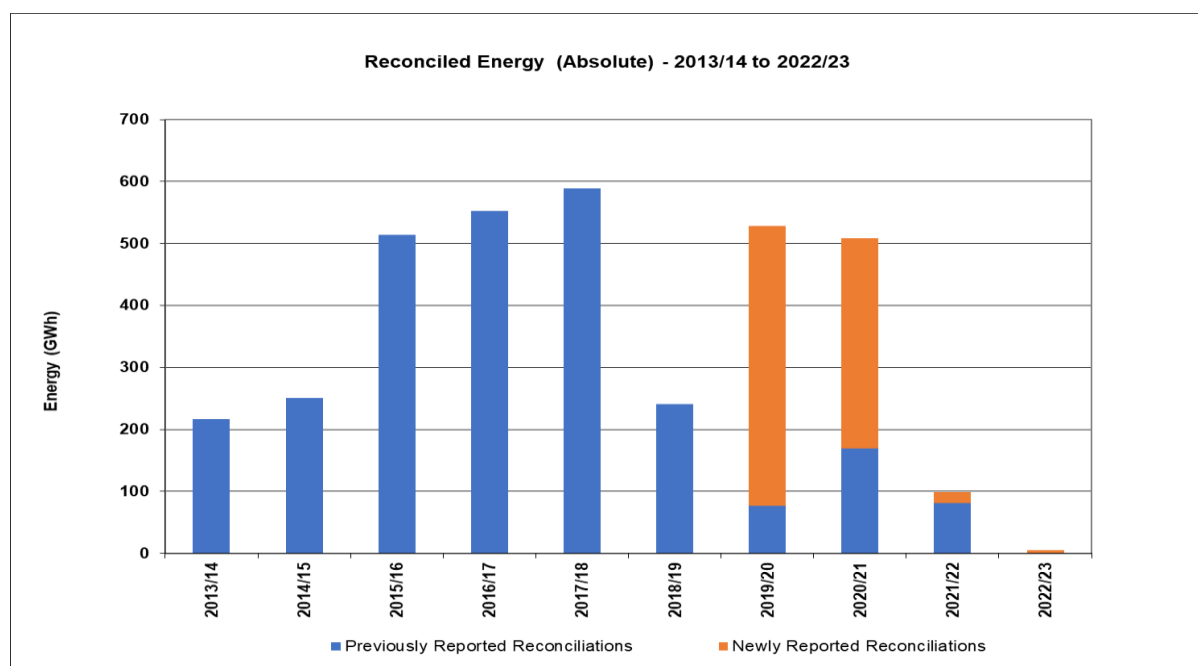


Figure 13: Reconciled energies (absolute) – 2013/14 to 2022/23

Of the 14 instances of reconciliation processed, 7 related to meter error and 7 related to data error (50% split of instances).

The majority of the energy reconciled over the period between 2019 & 2021 was due to a significant meter error at Alrewas EM LDZ Offtake, where the meter under registered 782.84 GWh of gas to the EM LDZ between May 2019 and February 2021.

(Further information for MER EM009 can be found on the Joint Office of Gas Transporters).

A second significant meter error at Thornton Curtis Offtake (EM LDZ) has also been identified impacting gas days between April 2022 to July 2022, this error is currently being investigated by two Independent Technical Experts (ITE's). (Further information can be found on the Joint Office of Gas Transporters website [click here](#)).

Reconciliation of this error will be carried out in due course after the ITE's have agreed the volume of error.

A further significant meter error has recently been identified at Royston Offtake (EA LDZ), the error impacts gas days between October 2021 and October 2022. Further information will be published on the Joint Office of Gas Transporters website.

Figure 14 below shows absolute reconciled energy against Assessed UAG with that reconciled energy as a % of UAG. Reconciliation on average, is below 20% of UAG with the exception of Formula years between 2016 and 2018 where UAG was particularly low.

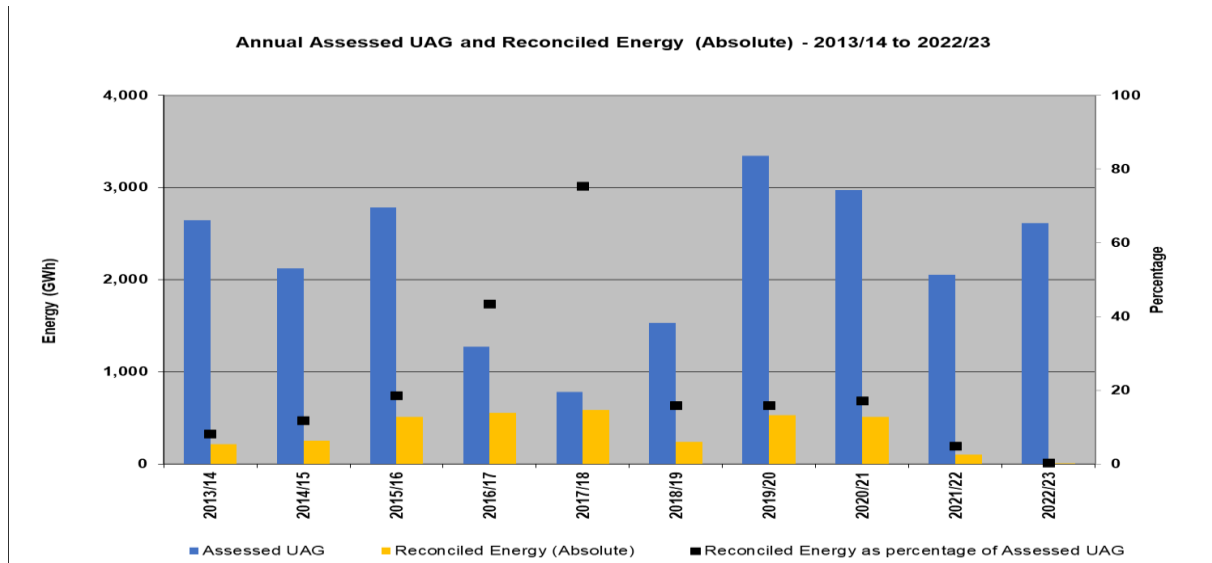


Figure 14: Annual Assessed UAG & Reconciled Energy (Absolute) – 2013/14 to 2022/23

NGG is continuing to improve its validation of end of day measurements to help address data quality challenges experienced during the pre-closeout period. One initiative that has been offered to the Sub Terminals is the automated handling of their data into our systems, reducing the opportunity for manual input errors to occur. This is gradually being taken onboard by Sub Terminals and NGG hopes that this can be rolled out to NTS Storage sites in the future.

NGG is continuing to process meter and data error reconciliations which will be included in future reports.

UAG Investigation

NGG manage projects to investigate the causes of UAG, particular interest has been the increase of assessed UAG that has been observed since October 2019. The projects also include historical and future UAG patterns or trends.

NGG's continued ambition is to better understand end to end data flows to identify and mitigate systematic data error, to automate and validate all data points and build the tools to identify the sources of UAG.

Since the publication of the April 2022 UAGCVS Report a mini project was undertaken, due to a new high UAG trend that was apparent between April & July 2022. The project helped us to understand and ensure assurance in our data and by carrying out site elimination checks using flow profiles across all sites, we were able to rule out any obvious outliers.

The project tasks included:

Understanding UAG as a percentage of throughput. UAG as a percentage of throughput had increased in Q2 with a step change from 0.2% to 0.6% when comparing to Q2 in 2021.

OBA – Steering Difference. The analysis did not find Interconnector Steering Difference and OBA being a contributing factor to the high UAG trend. OBA impacts UAG on a gas day but nets off over a 1 or 2 days.

Venting. Vented gas as a result of maintaining the NTS Network is calculated and provided to Meter Assurance as part of the NRO (Non-Routine Operation) guidelines. The vented volumes of gas calculated over this period were very small and not significant and therefore ruled out as a cause of the UAG trend.

NTS Maintenance. Maintenance dates and records were compared to UAG Trends to identify any correlation although there was no evidence of maintenance being a cause for the high UAG.

Site Elimination. Individual site profiles were analysed as well as looking for correlation between UAG and the number of sites flowing since 01/01/22. There were no obvious outliers from either of these investigations.

Interconnector & LNG Trends. Due to the higher volumes of gas seen at both LNG Terminals and the 2 Interconnection Points (IPs) at Bacton, it was prudent to compare UAG to historical periods when both LNG and IPs had large flows. As seen in Figures 15 and 16 below, there was some correlation observed with LNG when compared with UAG, which has been highlighted in previous reports but deeper dives into analysing the data at site level has not identified any error with the measurements. NGG continues to monitor these trends.

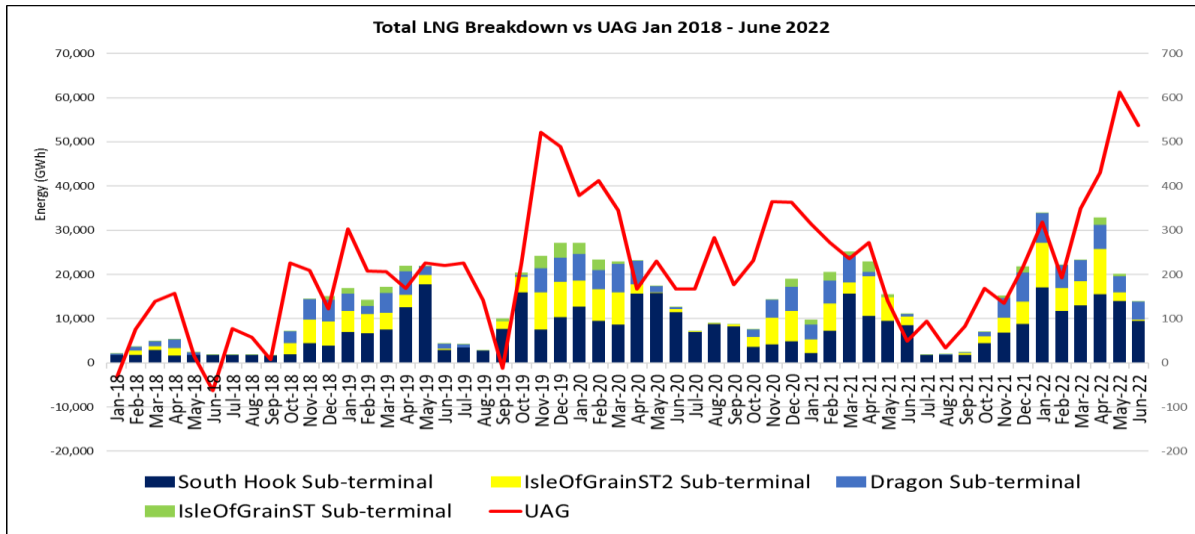


Figure 15: Total LNG Breakdown vs UAG Jan 2018 - June 2022

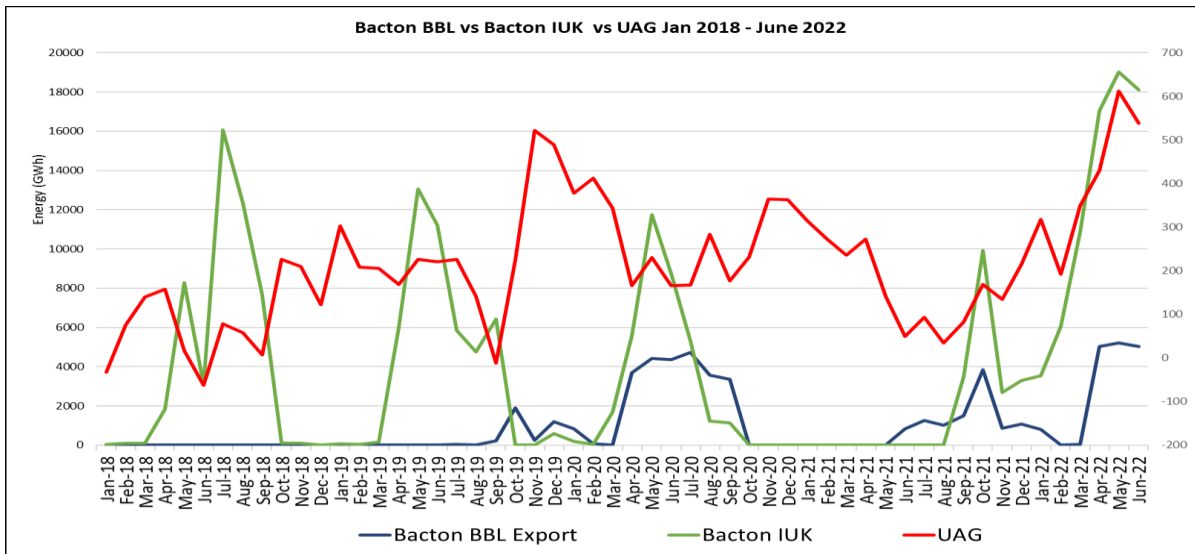


Figure 16: Total LNG Breakdown vs UAG Jan 2018 - June 2022

After this project had concluded, a significant meter error was then identified by Correla and Cadent at Thornton Curtis Offtake. The error impacted gas days between April and July 2022 and is likely to be a significant factor of UAG throughout this 6-month reporting period. A definitive error has not yet been published to the Joint Office of Transporters but is likely to be a feature of the April 2023 UAG Report.

Table 2 provides an overview of the UAG projects and initiatives NGG have planned over this Formula Year (2022/23).

Project / Initiative	Target Completion Date	UAG / CVS	OUTCOME
Enhancements to UAG Causality detection models	Wider 2022/23 reporting period	UAG	N/A for this report
Linepack calculation improvements	Wider 2022/23 reporting period	UAG	N/A for this report
Continuous improvement / process improvement to the Settlements Process and ability to validate site Measurements within Entry and Exit Closeout	Wider 2022/23 reporting period	UAG	A review has been completed with a concise set of current tools and new requirements documented. With new data models becoming available this autumn/winter, build of new tools will roll out into the next reporting period
Linepack Analysis using ground temperature	Wider 2022/23 reporting period	UAG	Progress has been made on a sample. Will be scaled up and findings brought to a future report. Considering further data science analysis
Consider impact of OBA on UAG calculation	Wider 2022/23 reporting period	UAG	We are looking at the benefits / risks of excluding OBA from the UAG calculation
Calculate UAG zonally across the NTS	Potential future project	UAG	The possibilities of this have been discussed with Network modellers. Due to the amount of new data points required to do this, it would be out of scope for this reporting period. Cost benefit analysis will steer this as a future project.
Review of ± 20 GWh baseline tolerances	Wider 2022/23 reporting period	UAG	N/A for this report
Investigate the impact of a lower Wobbe Index at NTS input terminals and how it could influence CVS	Wider 2022/23 reporting period	CVS	N/A for this report
LNG Gas Temperature – impact of temperature cooling as it leaves the Terminal. Scope would also include NTS compressors	Potential future project	UAG	

Table 2: Project initiatives for Formula Year 2022/23

Resource in the data science arena has been limited over the last 6 months due to other projects. The projects that are scoped in this section will be scheduled in the coming months dependent on resource availability.

CVS Statement & Investigation

Calorific Value Shrinkage (CVS) is gas which cannot be billed due to the application of Gas (Calculation of Thermal Energy) Regulations 1996 (amended 1997) and is the Local Distribution Zone (LDZ) energy difference between measured and billed Calorific Value (CV).

The regulations outline that the daily CV average for a given charging area is calculated by summing the product of the CV and volume for all supply inputs and dividing by the total volume of gas entering the charging area.

The maximum daily CV average for a charging area permitted by the regulations is equal to 1.0 MJ/m³ above the lowest measured daily CV of the supply inputs into that charging area, meaning if for any given day an input into a charging area has a CV outside of this range, a capped CV (lowest CV + 1MJ/m³) will be applied to the whole region for billing purposes. This is to protect customers who may live near this supply of lower quality of gas and prevent them overpaying for the gas they are receiving.

To calculate CVS, National Grid deduct the value that is used to bill downstream shippers based on the principles detailed above, from what was measured leaving the NTS by OFGEM approved equipment.

CVS occurs every day for all charging areas with more than one supply input into the region, this usually only equates to very small quantities if capping hasn't occurred and is a result of the charging area CV being rounded to one decimal place following its calculation. With CV capping being the major contributing factor to CVS, UNC Offtake Arrangement Document Section F 2.2 details that all parties cooperate with the view to avoid or minimise the amount of CVS each day.

With that in mind, if capping is caused by an NTS/LDZ offtake, National Grid will investigate, and where possible, minimise or avoid capping and will provide guidance to the Distribution Network Operator (DNO) to alter patterns of flow through the offtakes or alternatively look at solutions to alter flows within the NTS to improve blending of gases. If the capping is caused by a non-NTS connected asset that inputs gas into the LDZ, the DNO's will investigate the source and liaise with the relevant asset owner to avoid future instances.

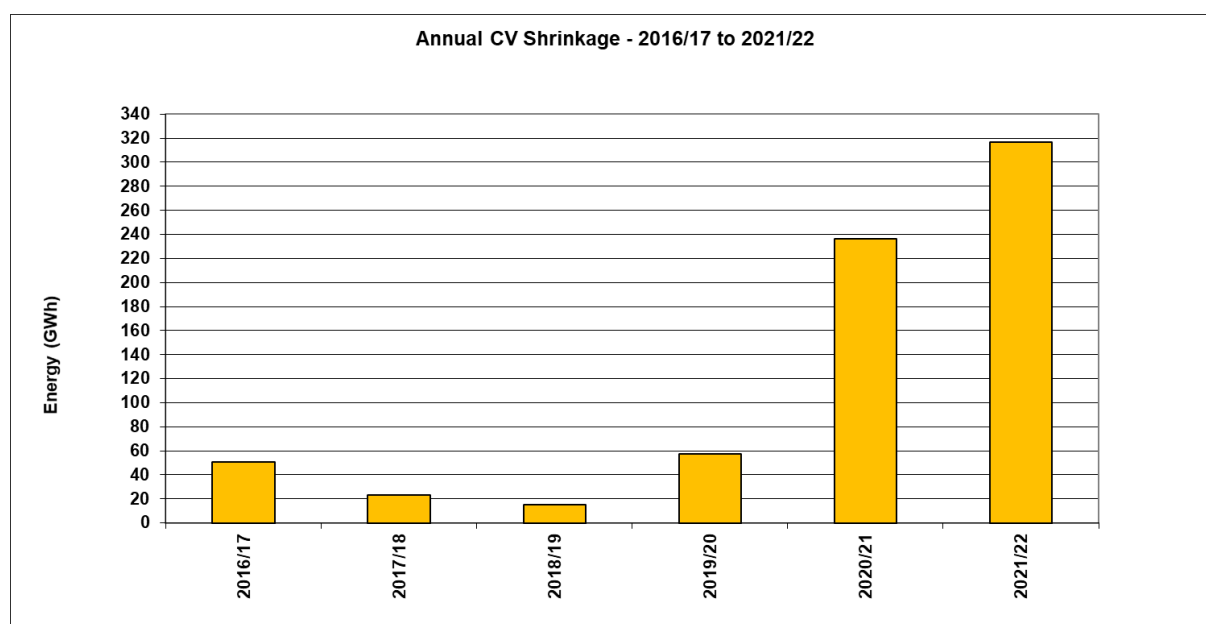


Figure 17 - Annual CV Shrinkage 2016/17 to 2022/23

Figure 17 provides a view of CV Shrinkage over the summer periods between 2016 and 2022. So far in 2022/23, CV Shrinkage has continued to rise when compared to the previous summer period.

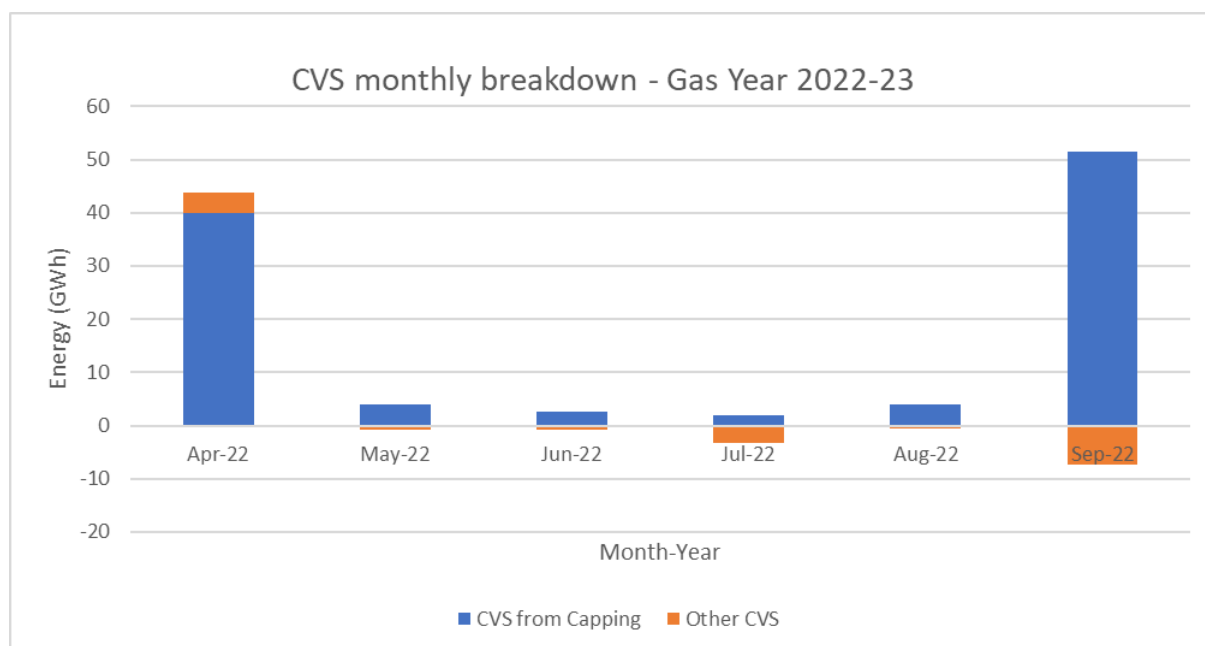


Figure 18 - CVS Monthly Breakdown 2022/23

Figure 18 provides a monthly breakdown of CV Shrinkage for 2022/23. This shows the proportion of CVS due to CV Capping detailed in blue and the remainder of other CVS in orange, which can be either positive or negative when not caused by CV capping. This is due to the rounding of the LDZ CVS to 1 decimal place, as previously mentioned.

Throughout the last six months, CV capping has equated to 103.79 GWh with capping occurring in 9 of the 13 LDZs. The impacted LDZs are EA, EM, NE, NO, NT, NW, SC, SW and WM with capping mainly in the months of April, May and September 2022 as seen in Table 3.

CV capping is still most prevalent in the North-East LDZ (NE) but this Summer there has also been a rise in the Scottish (SC) region. Northern LDZ (NO) has decreased since last year.

Month	CVS caused by Capping (GWh)													Total
	EA	EM	NE	NO	NT	NW	SC	SE	SO	SW	WM	WN	WS	
Apr-22	0.00	0.00	22.64	8.40	0.00	5.06	0.00	0.00	0.00	3.80	0.00	0.00	0.00	39.91
May-22	0.00	0.18	3.66	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.97
Jun-22	0.00	0.00	0.81	0.91	0.00	0.00	0.18	0.00	0.00	0.00	0.78	0.00	0.00	2.68
Jul-22	0.00	0.00	0.09	0.00	0.23	0.00	0.00	0.00	0.00	1.59	0.00	0.00	0.00	1.92
Aug-22	0.00	2.03	0.32	0.54	0.00	0.89	0.10	0.00	0.00	0.00	0.00	0.00	0.00	3.89
Sep-22	0.30	0.58	21.81	4.06	0.00	0.24	23.39	0.00	0.00	1.06	0.00	0.00	0.00	51.43
Totals	0.30	2.78	49.34	13.91	0.23	6.32	23.67	0.00	0.00	6.45	0.78	0.00	0.00	103.79

Table 3: CVS Caused by capping (GWh)

CV capping, when witnessed in NO and NE LDZ's, is mainly due to greater supplies of gas entering the region from the Teesside (NE) and Easington (NE) terminals. These terminals typically supply higher CV gas onto the NTS compared to gas flows entering those regions from St Fergus terminals with

typically lower CV's. Due to the location of these input terminals and the network configuration, blending of the higher and lower CV gases isn't achieved before it reaches the Offtake facilities within the LDZ's. Therefore, there is often a disparity in CV's entering those LDZ's, causing CV capping to occur.

Over the summer period between April and September 2022, NGG has seen an increase in Terminal supplies, when compared to the same months in 2021, St Fergus Terminals have increased flows by 28%, Teesside Terminals by 17% and Easington Terminals by 7%.

Bio Methane sites have also had an impact on CV Shrinkage in NE, NO & SC LDZ's, especially in September 2022. The reason behind why Bio Methane sites have caused capping in September is currently being investigated and will feature in future reports.

Conclusion

Continued support from meter owners has enabled NGG to obtain and review meter validation information for NTS entry and exit facilities. This data is being used to support the identification of causes of UAG, to enhance NGG's ability to detect meter error and to inform the preparation of future meter witnessing programmes.

The total assessed UAG quantity for the 1st April 2022 to 30th September 2022 period is greater than the previous six-month period. Monthly assessed UAG is also greater than the long-term average (April 2013 to September 2022) for all of the last 6 months, which is not in line with summer throughput behaviour. Metering error and increased throughput has been instrumental in UAG trends over this period.

NGG continue to improve its understanding of the causes of UAG through the use of data visualisation tools and investigative projects.

CV Shrinkage has increased in the summer period of Formula Year 2022/23 when compared to the same months in the previous year. CV Capping has continued to contribute towards the increase which has predominately been witnessed in NE, SC and NO LDZs.

Continued support from meter owners has enabled NGG to obtain and review meter validation information for NTS entry and exit facilities. This data is being used to support the identification of causes of UAG, to enhance NGG's ability to detect meter error and to inform the preparation of future meter witnessing programmes.

Appendix I - National Grid Gas Plc (NTS) Gas Transporter Licence Special Condition Part J 5.6

Part J: Requirement to undertake work to investigate the causes of UAG and CVS

5.6.53 The licensee must use reasonable endeavours to undertake UAG Projects and compile a CVS Statement for the purposes of investigating the causes of UAG and CVS for each Regulatory Year.

5.6.54 The licensee must, unless the Authority otherwise directs, publish the UAGCVS Reports and provide a copy to the Authority by 1 May and 1 November in each Regulatory Year for the preceding six month period ending on 31 March and 30 September respectively.

5.6.55 The licensee must outline in the UAGCVS Report:

- (a) the UAG Projects the licensee has undertaken in the previous period;
- (b) the UAG Projects the licensee proposes to undertake in the next period and its views on whether, and if so how, the findings of the UAG Projects may be taken forward in order to reduce the volume of UAG;
- (c) the reasons why any UAG Projects that the licensee proposed to undertake have not been undertaken during the Regulatory Year;
- (d) a CVS Statement outlining the work conducted during the previous period to investigate CVS, and explaining the licensee's understanding of the causes of CVS;
- (e) any additional activities and inspections undertaken by the licensee to improve metering calibration and accuracy;
- (f) a summary of any relevant discussions concerning UAG or CVS at industry fora and with interested parties on a one-to-one basis; and
- (g) any data or information related to UAG or CVS that the Authority may reasonably request.

5.6.56 During the period of 28 days beginning with the date of publication of a UAGCVS Report the licensee must, unless the Authority otherwise consents, publish on its website all the relevant data referred to in the UAGCVS Report.

Interpretation and definitions UAG

is unaccounted for gas and means the amount of gas (GWh) that remains unaccounted for after the Entry Close-out Date following the assessment of NTS Shrinkage performed in accordance with the Uniform Network Code. **UAG Projects** means the projects currently undertaken by the licensee including:

- (a) the witnessing by the licensee of the validation of Measurement Equipment at NTS System Entry Points or Supply Meter Installations at NTS Exit Points; and
- (b) investigation and analysis of data in order to seek to identify causes of UAG.

UAGCVS Report

means a report required under Part J of Special Condition 5.6 (System operator external incentives, revenues and costs).

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