Demand Estimation Sub Committee

4.2 Algorithm Performance Gas Year 2021/22
Strand 2 - UIG Analysis

13th December 2022

Contents

Background – Strand 2: UIG Analysis

- Demand Attribution – Daily Balancing

- Unidentified Gas (UIG) represents the balancing figure in the daily demand attribution calculation and will naturally include any modelling error in the estimate of NDM Energy. UIG will also 'sweep up' any inaccuracies in the LDZ Input, DM Energy or Shrinkage values

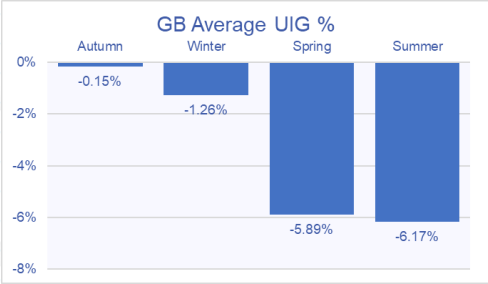
- Strand 2: UIG Analysis can therefore be used as an indicator of the performance of the NDM Algorithm by reviewing UIG volumes and trends which can provide context when reviewing the Strand 3 results

- This Strand also considers the AQ (e.g. trends during the Gas Year) as this is a key input to the NDM Algorithm

Objectives

- To analyse UIG percentages for Gas year 2021/22 by season:
  - Autumn: Oct’21 to Dec’21
  - Winter: Jan’22 to Mar’22
  - Spring: Apr’22 to Jun’22
  - Summer: Jul’22 to Sep’22
- To compare the UIG values for Gas Year 2021/22 with the previous Gas year 2020/21
- Use boxplots and distribution graphs to measure how UIG has varied by season
- Consider how underlying AQ trends may have had an impact on UIG levels throughout Gas Year 2021/22

Executive Summary

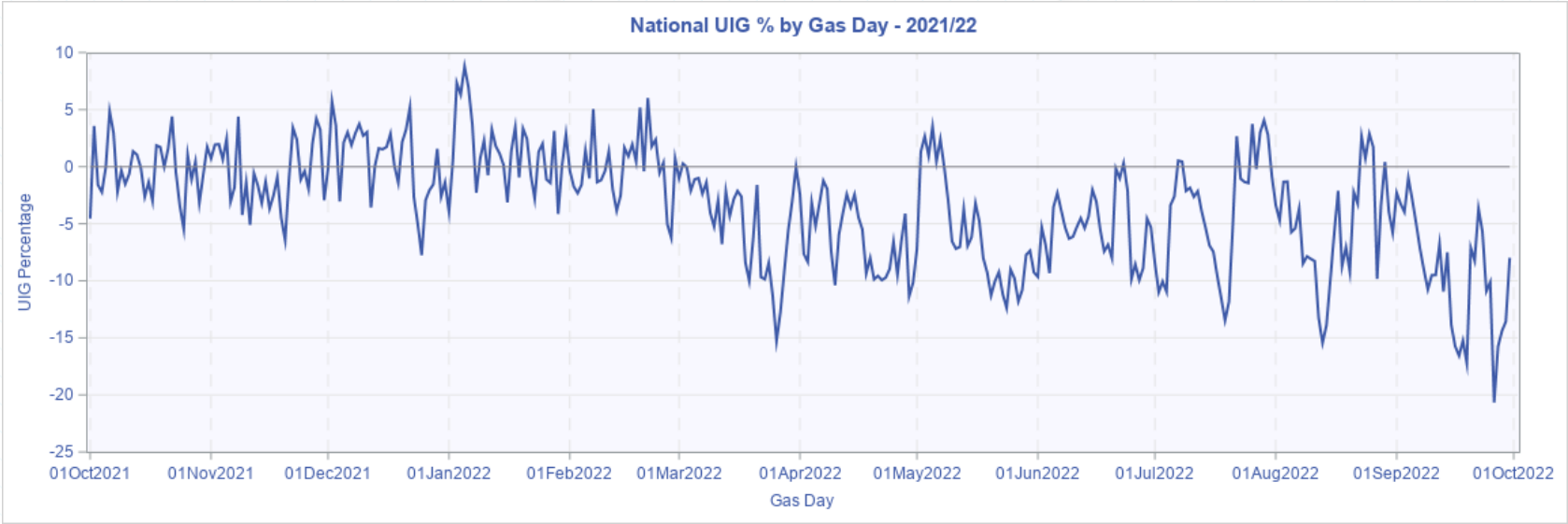


- There has been a clear trend of high negative UIG values across all LDZs and the national equivalent, particularly in Spring and Summer of 2022
- Increases in consumer energy bills has led to a conservation in gas usage, this combined with unusually warm weather has resulted in large overallocation of demand in the NDM sector
- Domestic AQ's have declined each month across the entire Gas Year, however due to the nature of the calculation this has not been enough to keep up with the 'step change' in end consumer behaviour

01BND Avg. AQ
Oct'21: 13,747 kWh
⬇ 6.50%
Oct'22: 12,854 kWh

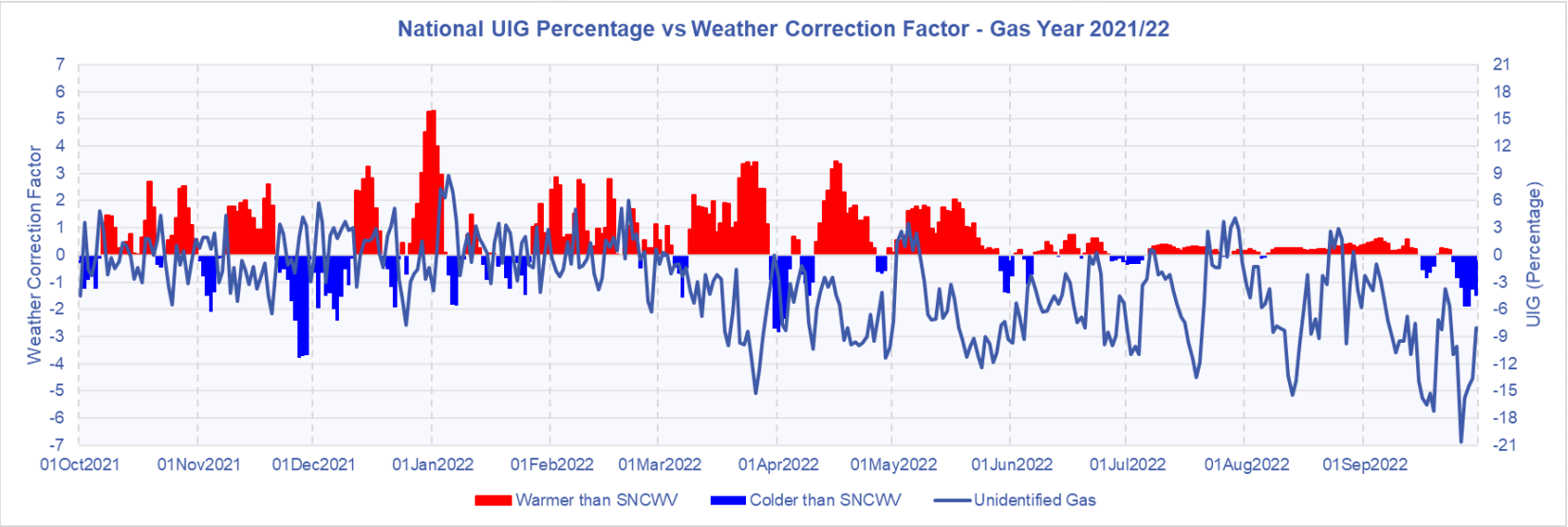
- In general, following reconciliation, latest UIG percentages have moved to more positive values, a further indication of NDM Overallocation

Analysis – Daily observed National UIG



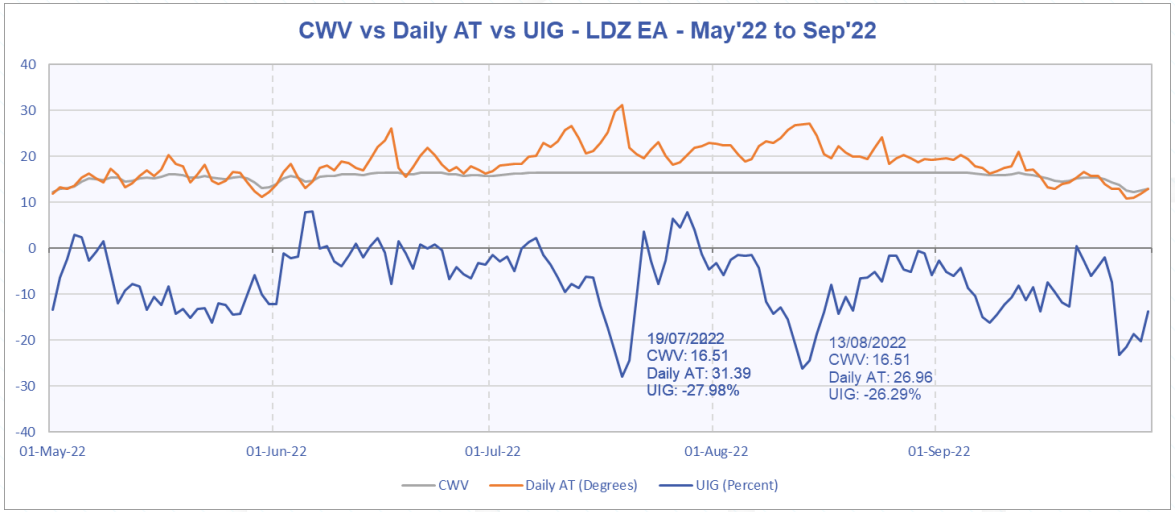
- The Daily National UIG at D+5 ranged from -20.66% to 8.78% and had an average value across the Gas Year of –3.37%
- There is a clear shift towards negative UIG from March 2022 onwards
- This can be directly attributed to an over estimation of NDM demand, which is being driven by increasing gas prices and reductions in consumption which are not necessarily reflected in AQ levels

Analysis – National UIG vs GB WCF



- The negative UIG effects from March 2022 onwards have been exacerbated by an exceptionally warm Spring and Summer
- Some of the largest (negative) UIG values can be observed in September 2022, where temperatures have dropped below seasonal normal for the first sustained period since early July

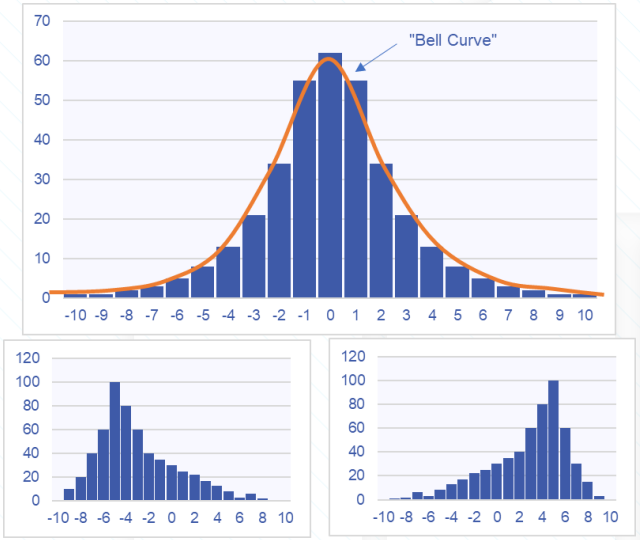
Analysis – Impact of exceptional Temperatures

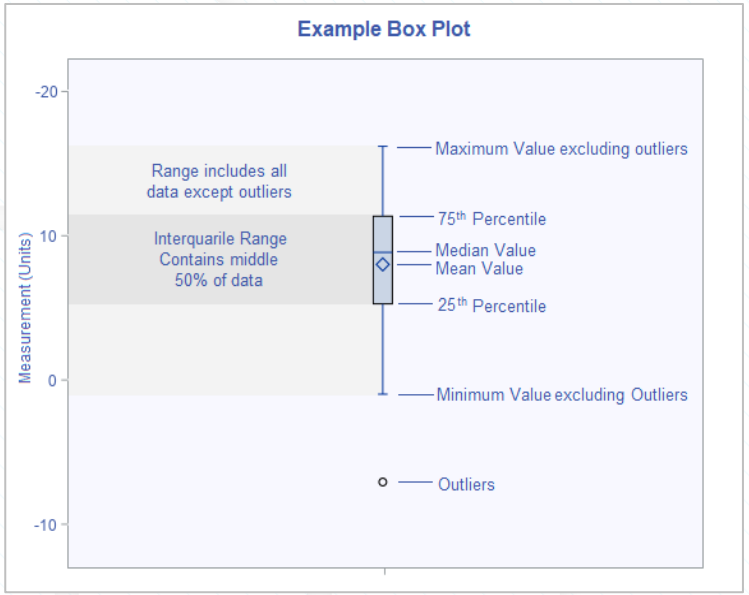


- Chart shows the daily Actual temperature (Daily AT), CWV values and UIG percentages for LDZ EA from 01st May 2022, to 30th September 2022
- The highlighted gas days show spikes in UIG which correspond with Daily AT values far exceeding the maximum CWV value

- 19th July 2022 saw record UK temperatures, reaching 40 degrees. 13th August was amidst a heatwave in the warmest August on record
- This potentially suggests the Maximum CWV has not reduced NDM enough during these significant heat events, this will be investigated during the next CWV formula review
- Caveated by change in consumer behaviour on top of exceptionally warm weather, would negative UIG have been so prominent under 'normal' consumption patterns?

Introduction to Tests used

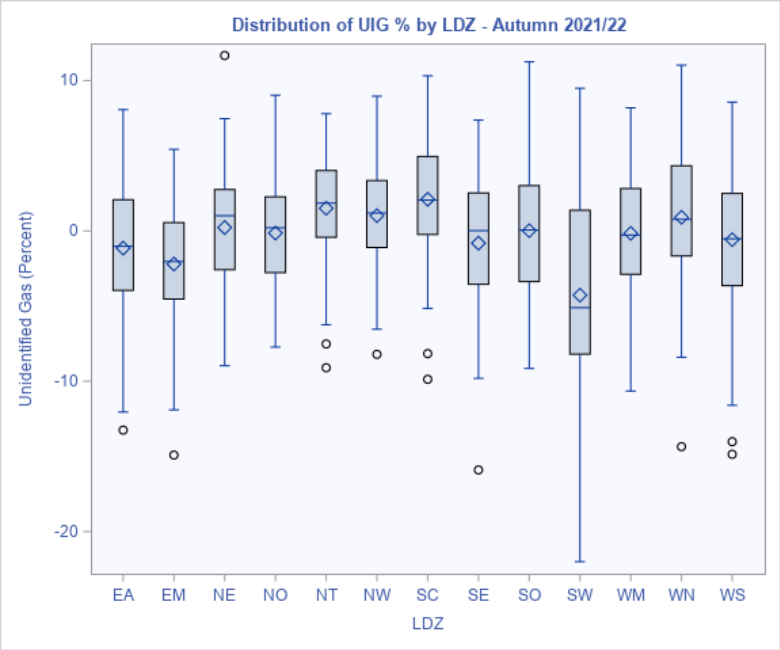




- Histograms have been used to assess the distribution (spread) of UIG
- Data can be spread in different ways
  - Symmetrical with no bias left or right (normal)
  - Skewed to the left or right, a greater proportion of measurements lie either side of the peak value, indicating a bias in the data

- Box Plots have also been used to demonstrate the spread and skewness of the data, and highlight outliers

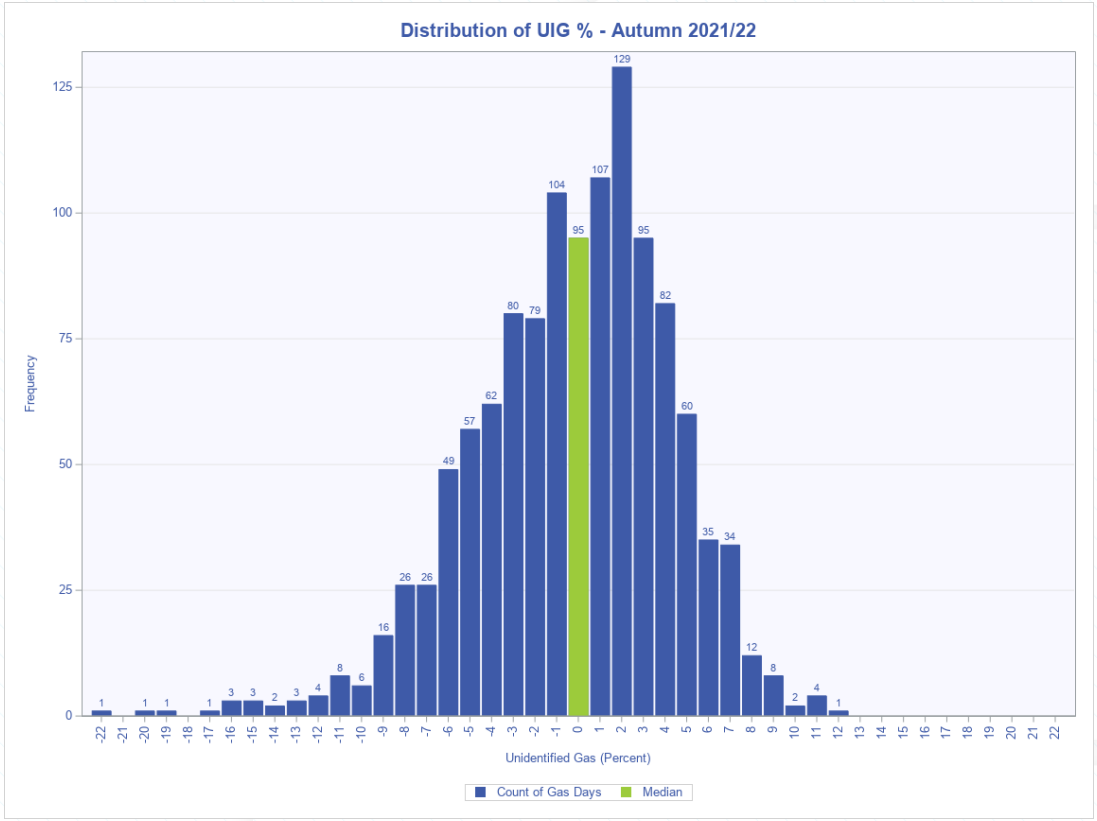
Analysis – Autumn 2021/22



- Average LDZ UIG values during the period October'21 to December'21 ranged from -4.27% in LDZ SW to 2.10% in LDZ SC
- Distribution for most LDZs appear to be similarly distributed between -10% and +10% with the exception of LDZ SW which has a lower average, and bigger range of outliers
- Average daily (absolute) UIG volume during Autumn was 4.63 GWh

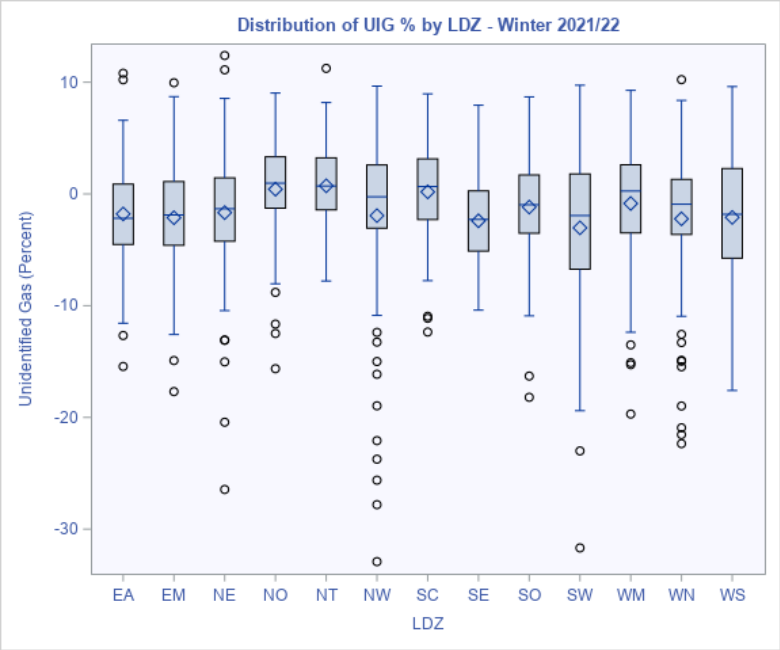
Average UIG% by LDZ - Autumn												
EA	EM	NE	NO	NT	NW	SC	SE	SO	SW	WM	WN	WS
-1.14%	-2.21%	0.23%	-0.14%	1.51%	1.02%	2.10%	-0.82%	0.02%	-4.27%	-0.16%	0.90%	-0.58%

Analysis - Autumn 2021/22



- The average daily UIG value across all LDZs during Autumn was -0.27%, the median value was 0.18%
- 95% of values fell between –10.0% and 7.4%
- UIG Values in Autumn are generally evenly distributed around the median value with a few noticeable negative outliers

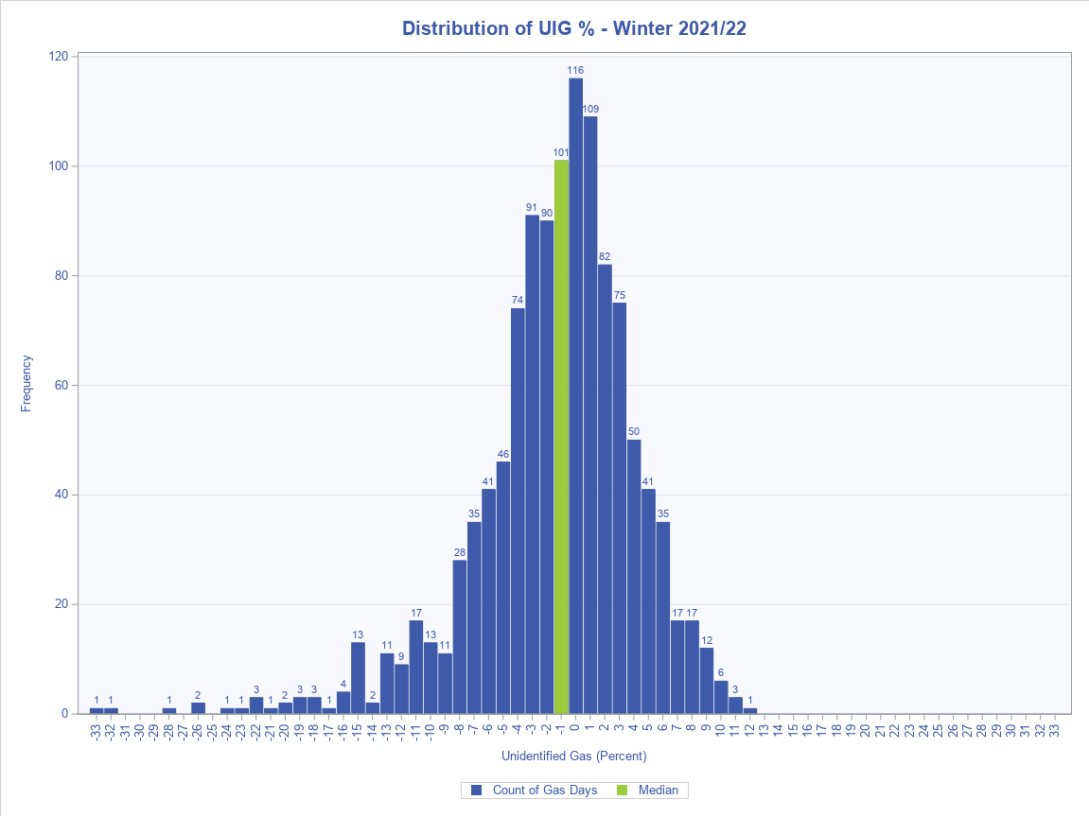
Analysis – Winter 2021/22



- Average LDZ UIG values during the period January'22 to March'22 ranged from -3.04% in LDZ SW to 0.73% in LDZ NT
- 10 of 13 LDZs had a Negative average UIG value during Winter 2021/22
- There are several negative outliers in Winter, particularly in LDZs WN and NW. This corresponds with a spell of warm weather toward the end of March'22 and the beginning of a general downturn in UIG levels
- Average daily (absolute) UIG volume during Winter was 6.00 GWh

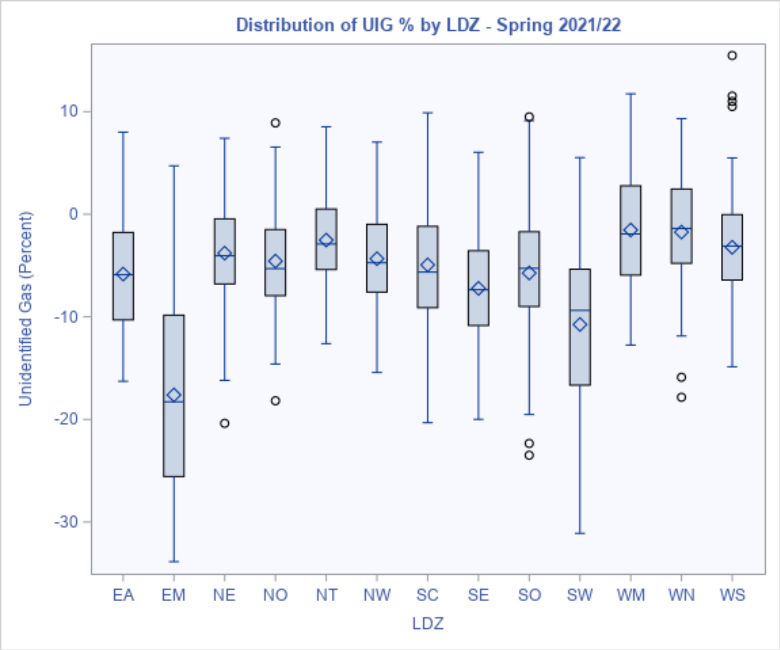
Average UIG% by LDZ - Winter												
EA	EM	NE	NO	NT	NW	SC	SE	SO	SW	WM	WN	WS
-1.79%	-2.13%	-1.67%	0.42%	0.73%	-1.94%	0.18%	-2.40%	-1.17%	-3.04%	-0.85%	-2.22%	-2.10%

Analysis - Winter 2021/22



- The average daily UIG value across all LDZs during Winter was -1.38%, the median value was -0.77%
- 95% of values fell between –15.1% and 8.0%
- Negative outliers towards the end of March 2022 can be observed on the left-hand side of the distribution

Analysis – Spring 2021/22

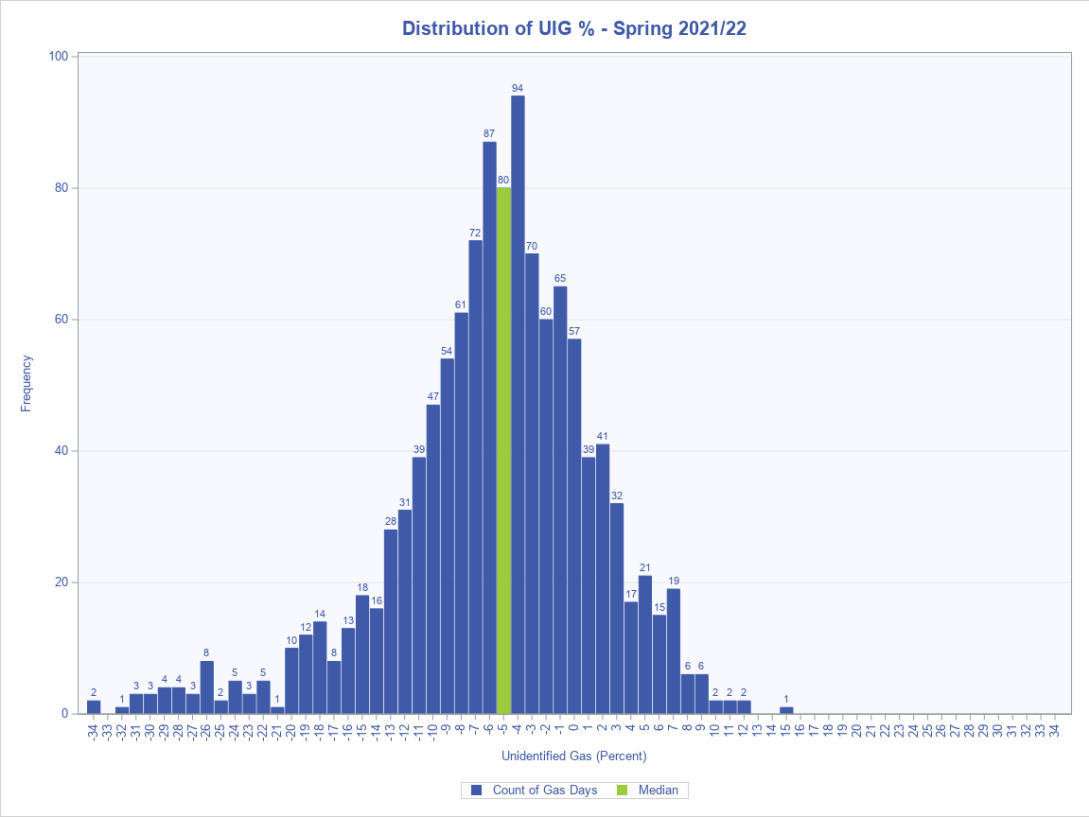


- Average LDZ UIG values were all negative during Spring, ranging from -17.62% in LDZ EM to -1.54% in LDZ WM
- LDZ EM stands out as particularly negative. This is due, in part, to a metering error which was causing under-reporting in the LDZ input
- LDZ SW appears to have a wider spread than most other LDZs
- Average daily (absolute) UIG volume during Spring was 5.18 GWh

Average UIG% by LDZ - Spring												
EA	EM	NE	NO	NT	NW	SC	SE	SO	SW	WM	WN	WS
-5.83%	-17.62%*	-3.80%	-4.57%	-2.52%	-4.33%	-4.93%	-7.23%	-5.73%	-10.75%	-1.54%	-1.74%	-3.22%

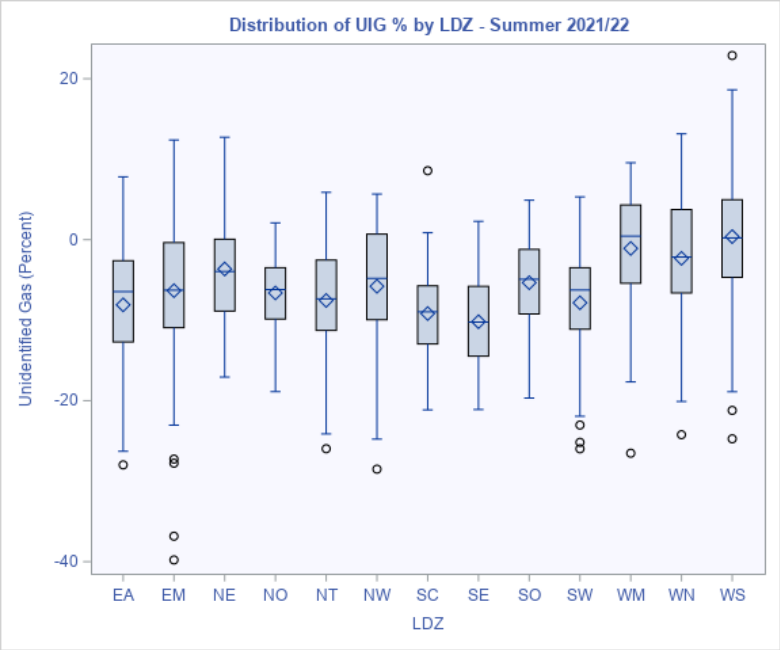
* - EM data contains metering error for Thornton Curtis site (linked) – UIG was significantly impacted for Gas Days 21/04/2022 to 04/07/2022

Analysis – Spring 2021/22



- The average daily UIG value across all LDZs during Spring was -5.68%, the median value was -5.08%
- 95% of values fell between –24.6% and 6.8%
- There is a clear skew towards negative values during Spring,
- Several of the highly negative values belong to EM during the period of the Thornton Curtis metering error

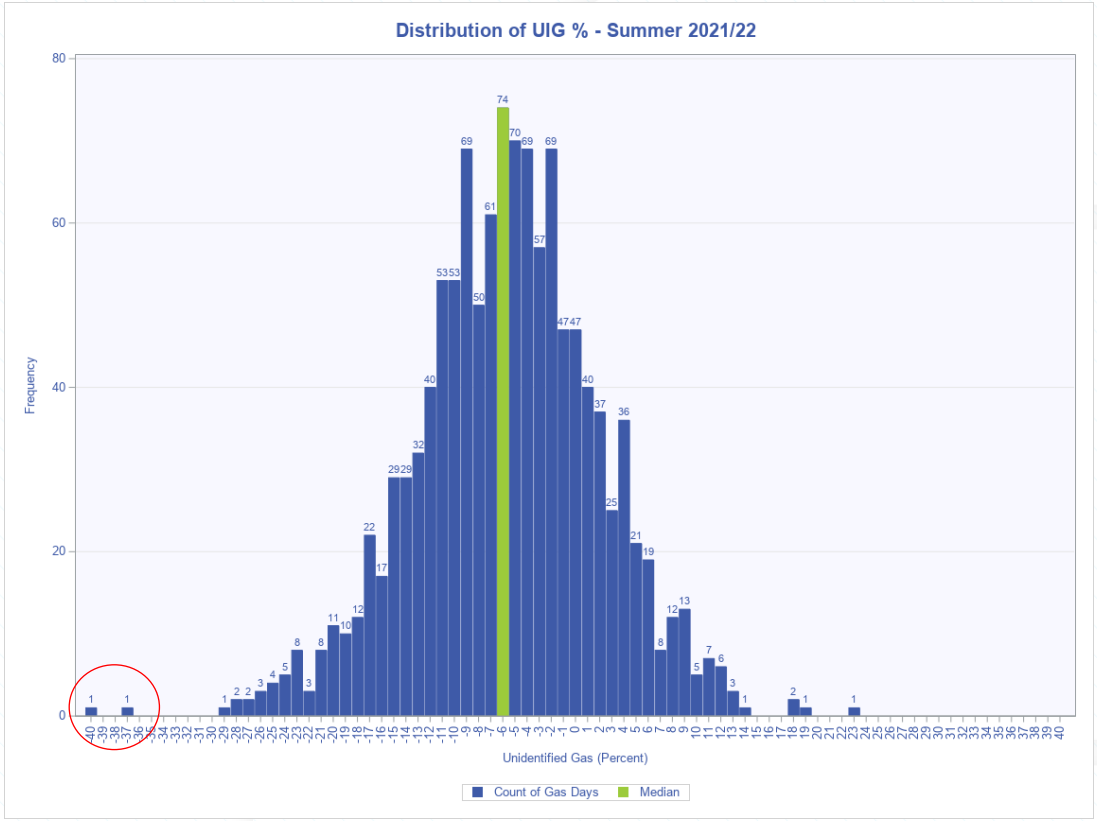
Analysis – Summer 2021/22



- Average daily LDZ UIG values ranged from -10.19% in LDZ SE up to 0.38% in LDZ WS, with WS being the only LDZ with a positive average daily UIG value.
- Distributions across all LDZs in Summer appear to be fairly similar, but with wider tails than previous seasons
- The single largest daily negative and positive UIG percentages were observed in summer:
  - LDZ EM Gas Day 02/07/2022, a value of -39.79%
  - LDZ WS Gas Day 29/07/2022, a value of 22.88%
- Average daily (absolute) UIG volume during Summer was 3.94 GWh

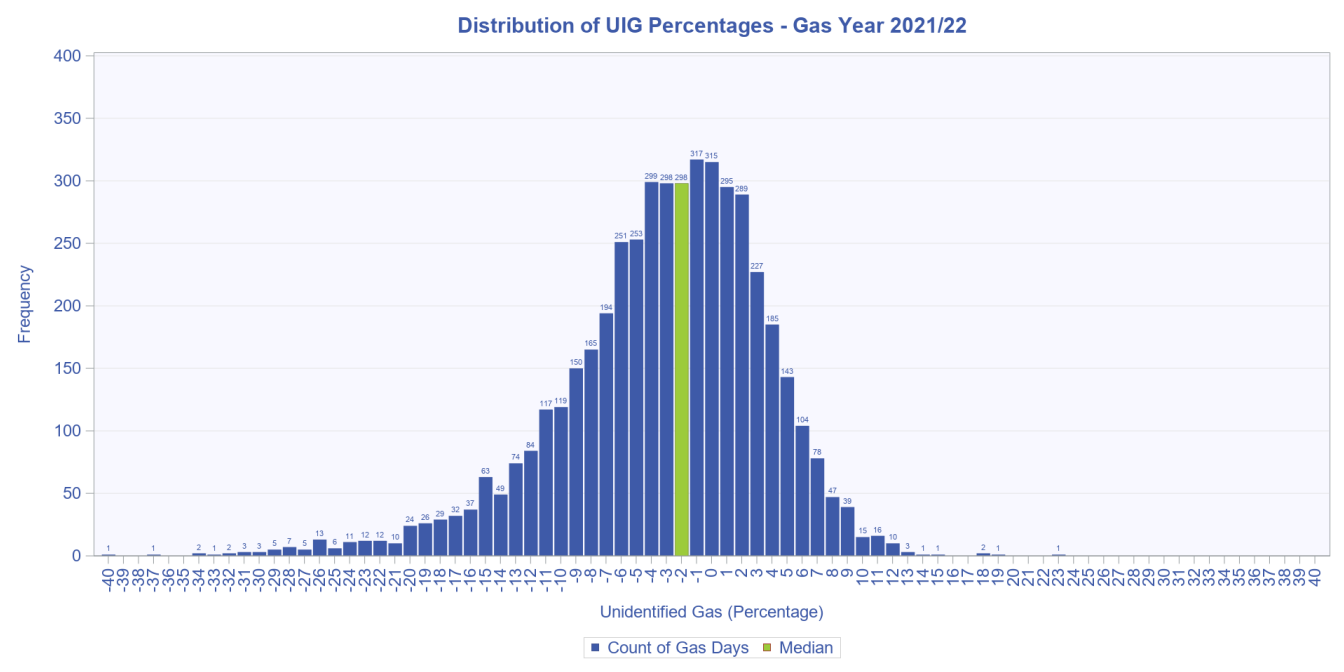
Average UIG% by LDZ - Summer												
EA	EM	NE	NO	NT	NW	SC	SE	SO	SW	WM	WN	WS
-8.10%	-6.33%	-3.65%	-6.62%	-7.55%	-5.79%	-9.17%	-10.19%	-5.35%	-7.84%	-1.09%	-2.33%	0.38%

Analysis – Summer 2021/22



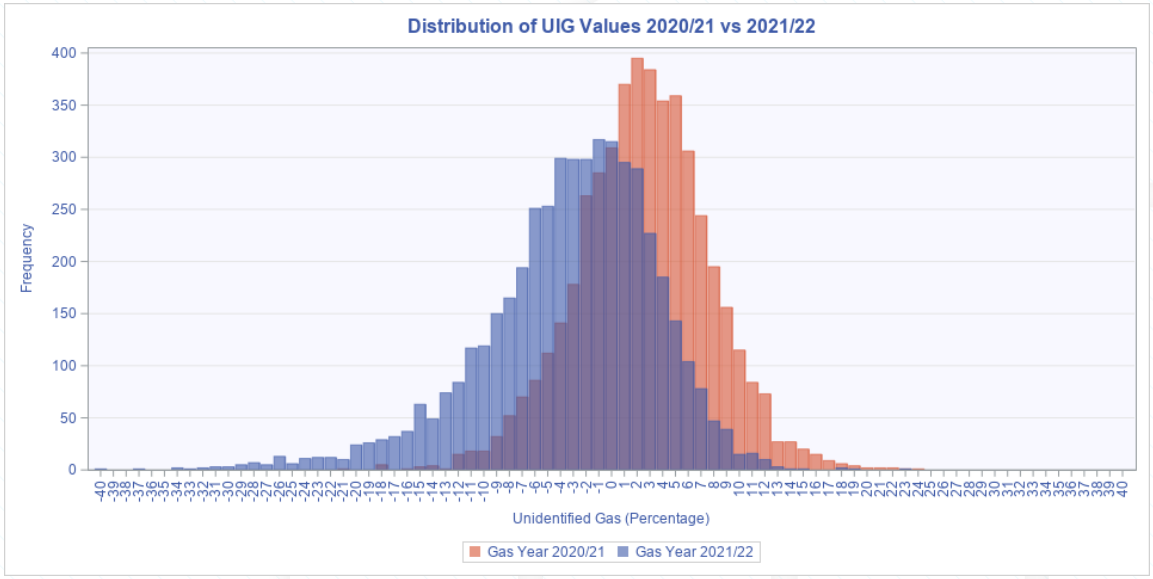
- The average daily UIG value across all LDZs during Summer was -5.66%, the median value was -5.53%
- 95% of values fell between –21.6% and 9.0%
- The 2 heavily negative outliers on the left-hand side relate to LDZ EM on 2nd and 3rd July 2022, and can be partly explained by the Thornton Curtis metering error

Analysis – Gas Year 2021/22



- The average daily UIG value across all LDZs for Gas Year 2021/22 was -3.25%. The Median value was -2.45%
- There is a clear negative skew to the UIG values across the gas year

Analysis – Comparison of Gas Years 2020/21 and 2021/22



Average daily LDZ UIG by season (absolute)

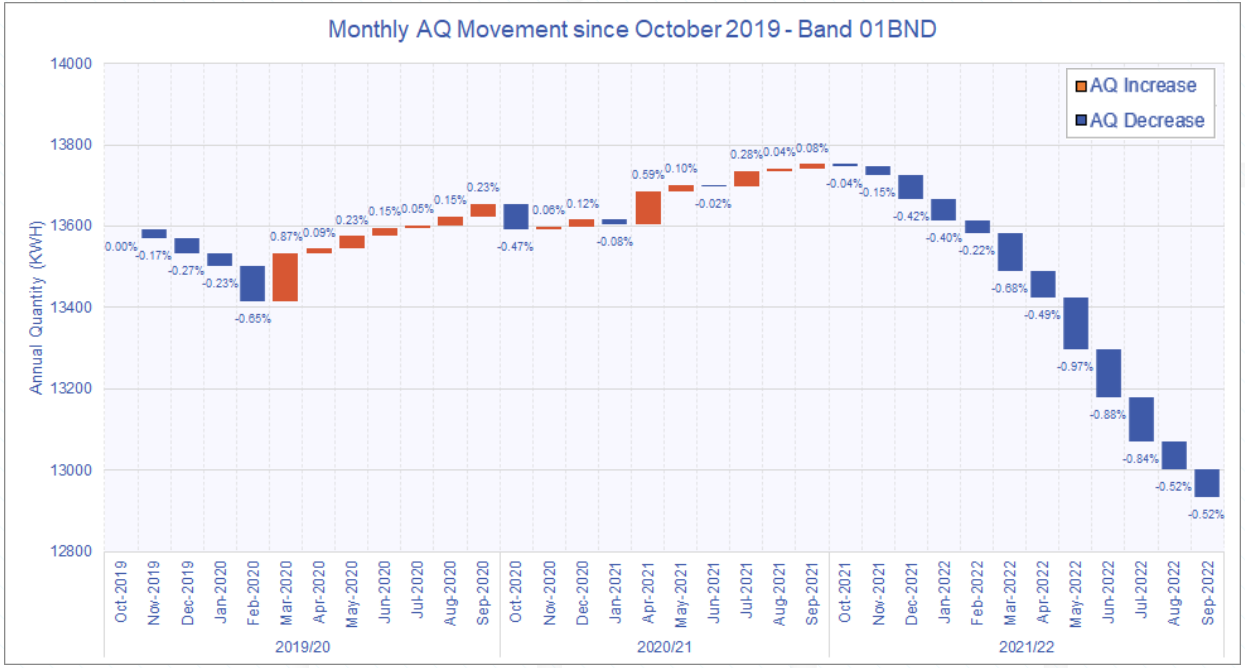
Season	Gas Year	
	2020/21	2021/22
Autumn	6.32	4.63
Winter	7.39	6.00
Spring	5.84	5.18
Summer	2.21	3.94
All (GWh)	**5.43**	**4.93**

- A comparison of the average daily UIG volumes (absolute) for Gas Year 2020/21 and 2021/22

- When comparing Gas Year 2021/22 to the previous Gas Year, 2020/21, there is a flatter distribution and a clear shift towards negative UIG values.

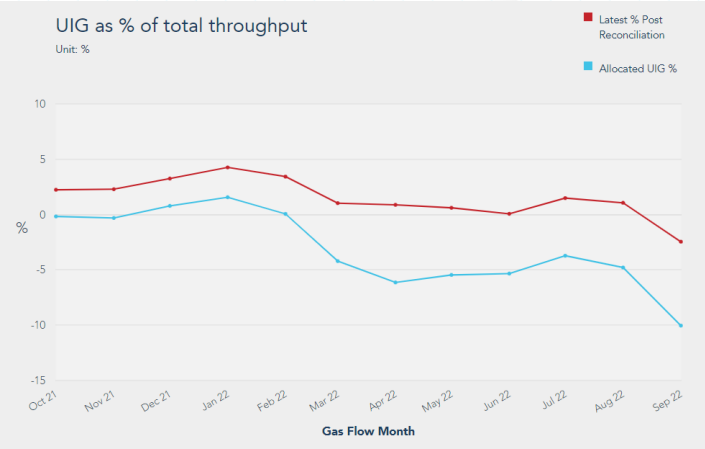
- Compared to the previous Gas Year, there are many more days which have seen high negative UIG values

Analysis – AQ Trends Consumption band 01BND

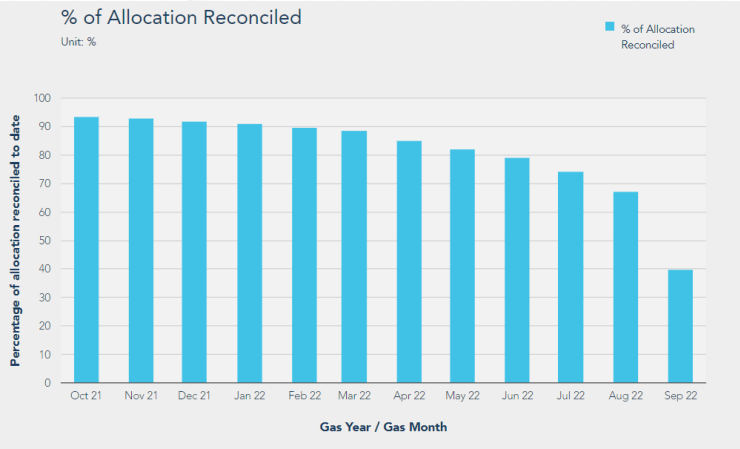


- The Demand Estimation news article published in May 2022, gave some context to the negative UIG values being observed across the county
- It was suggested then that AQs were running too high and this was playing a key role in the over allocation of NDM and subsequent negative UIG values.
- Since the update in May 2022, monthly AQ values have continued to steadily decrease. From October 2021 to October 2022, band 01BND saw an overall 6.50% decrease in it's average AQ

Analysis – UIG Post Reconciliation



Source: UIG as % of total throughput - XOSERVE



Source: Chart - % of allocation reconciled - XOSERVE

- Blue line confirms low/negative UIG for Gas Year
- During 2022 there have been significant credit reconciliation volumes on the monthly Amendment Invoice
- Red line confirms this by providing an estimated view of UIG by month post reconciliation. This has returned to being a positive value.

- Shows proportion of original gas allocation at D+5 each month which has now had meter point reconciliation
- In general the more energy has been reconciled, the closer to the 'final' UIG position

Conclusions

- Average daily national UIG (at D+5) has decreased from 2.65% in Gas Year 2020/21 to –3.37% in Gas Year 2021/22
- The following table shows the daily national average, as well as the highest and lowest average UIG value at LDZ level by season

Season	National Daily Average	Lowest absolute average UIG (LDZ)	Highest absolute average UIG (LDZ)
Autumn	-0.15%	0.02% (SO)	-4.27% (SW)
Winter	-1.26%	0.18% (SC)	-3.04% (SW)
Spring	-5.89%	-1.54% (WM)	-17.62% (EM)
Summer	-6.17%	0.38% (WS)	-10.19% (SE)

- The shape of the distribution of UIG for Gas Year 2021/22 is noticeably skewed compared to Gas Year 2020/21, mainly driven by the negative UIG values witnessed during Spring and Summer of 2022
- Consumer behaviour patterns have noticeably affected UIG levels, as witnessed by the continued reduction in domestic AQ levels. Following Reconciliation, UIG percentages have moved closer to positive values
- Supporting document containing full examples and commentary for all 3 strands will be published as part of Section 12 of next year's NDM Algorithms Booklet.