2.1 Algorithm Performance

(Gas Year 2020/21)

Strand 2 – UIG Analysis

Demand Estimation Sub Committee
14/12/2021

Provided by:

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Section 1: Background, Objectives and Approach

Background

- Following the implementation of project Nexus on 1st June 2017 Unidentified Gas (UIG) is now the balancing figure in each LDZ for each Gas Day
- UIG is calculated using the following formula

$$UIG = Total\ LDZ\ Throughput - Shrinkage - DM\ Measurements - NDM\ Allocation$$

- As UIG is the balancing figure, modelling error in the estimate of NDM Allocation can be a major contributor to daily UIG levels

Objectives and Approach

- To analyse UIG percentages for Gas Year 2020/21 by seasons:
  - Autumn: Oct'20 to Dec'20
  - Winter: Jan'21 to Mar'21
  - Spring: Apr'21 to Jun'21
  - Summer: Jul'21 to Sep'21

- To compare the UIG values for Gas Year 2020/21 with the previous Gas Year 2019/20

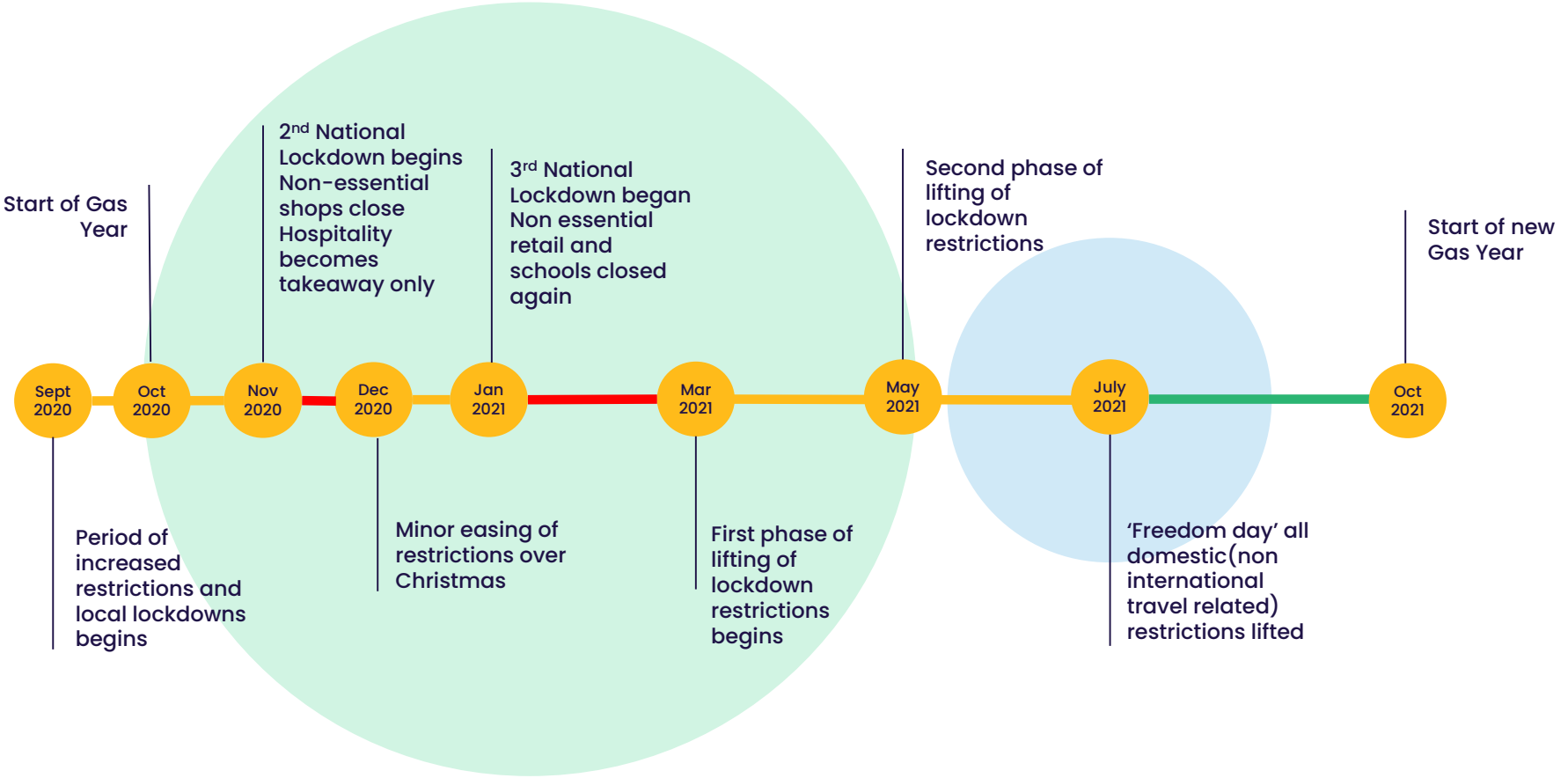
- Use boxplots and distribution graphs to measure how UIG varies by season and LDZ

- 2020/21 is the second Gas Year to be affected by COVID restrictions and lockdowns. National Lockdown days throughout this presentation refer to when the nation was under its strictest 'Lockdown' conditions. These periods are defined as:
  - Second National lockdown: 05/11/2020 to 02/12/2020
  - Third National lockdown: 06/01/2021 to 07/03/2021.

- Localised lockdowns and different behavioural patterns (e.g. Home Working) will also have persisted outside of this defined period, slide 6 provides an overview of the COVID impacts to Gas Year 2020/21

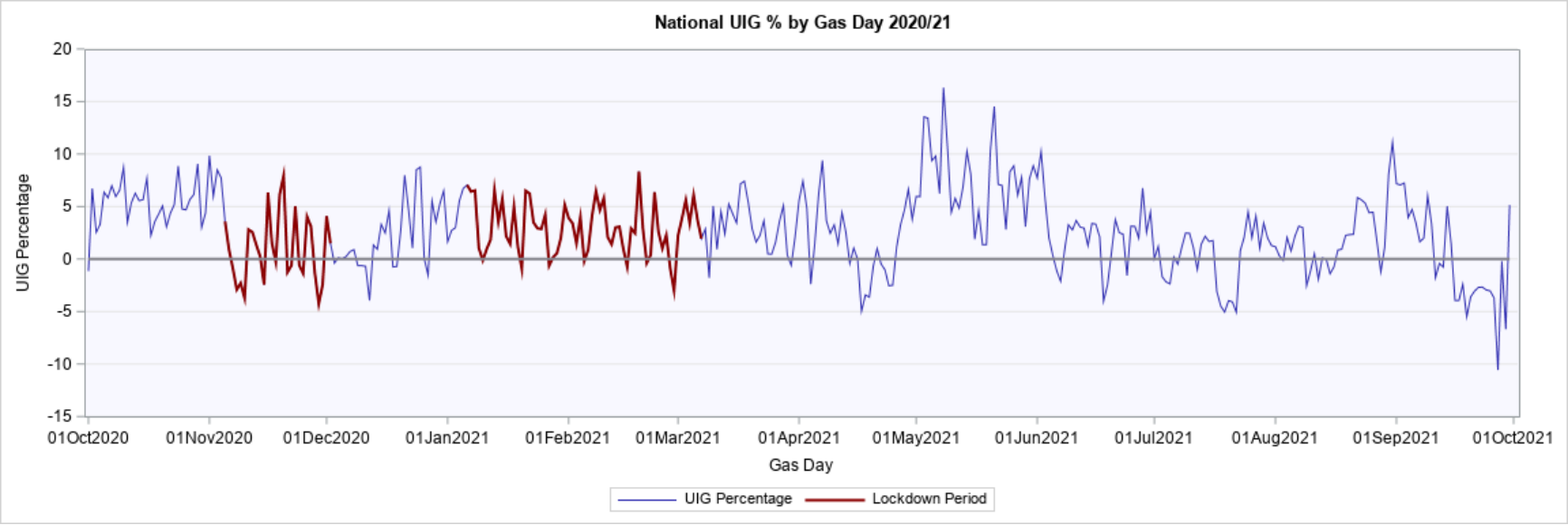
- Note: The causes of UIG on a daily basis are not considered here

COVID-19 Impact Timeline – Gas Year 2020/21



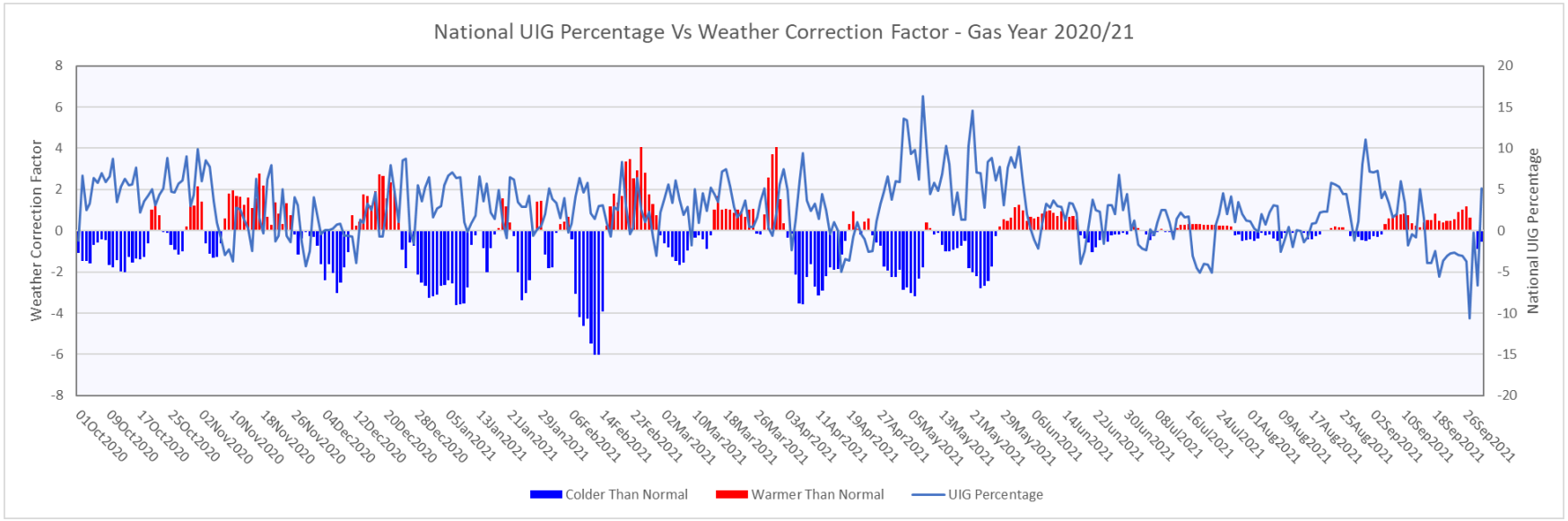
Section 2: UIG Analysis

Daily observed UIG - National



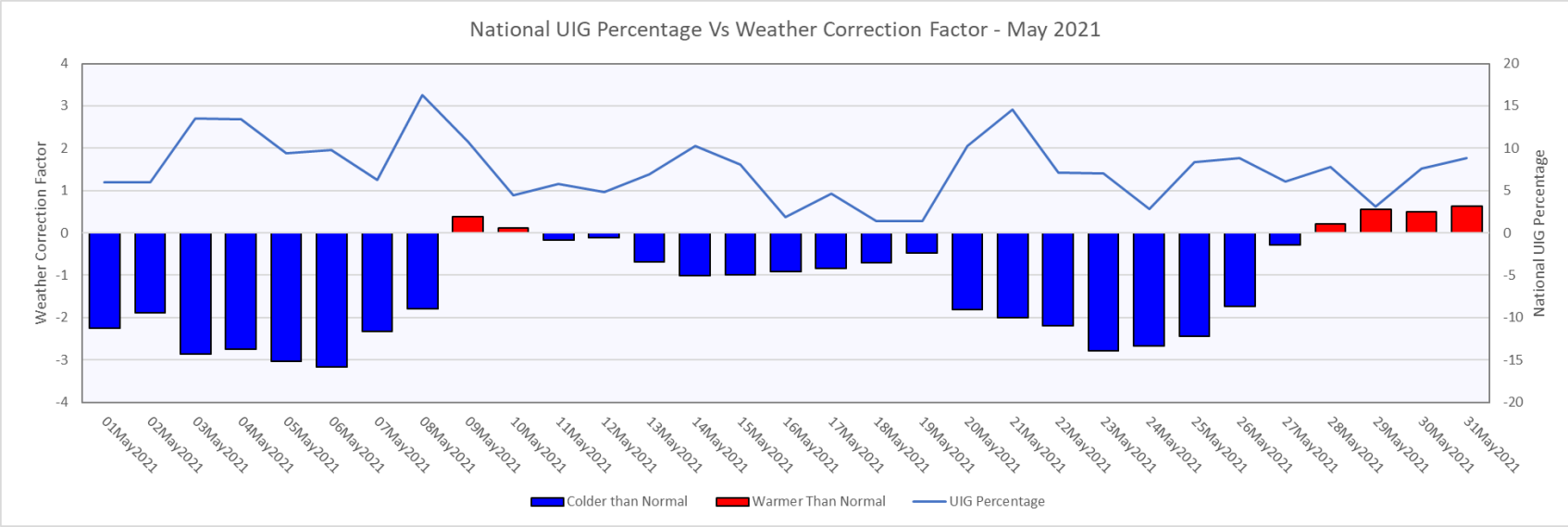
- The National average UIG at D+5 was 2.65%
- UIG percentages during the second National lockdown (Nov to Dec) appear slightly lower than the surrounding months, however this pattern does not appear to be observed for the third National lockdown (Jan to Mar) where values are in line with the surrounding months.
- The effects of COVID are less obvious during the second and third lockdowns than during the first in Gas Year 2019/20, possibly due to the AQ position being more reflective of Post-COVID behavioural changes.

National UIG vs Weather Correction Factor



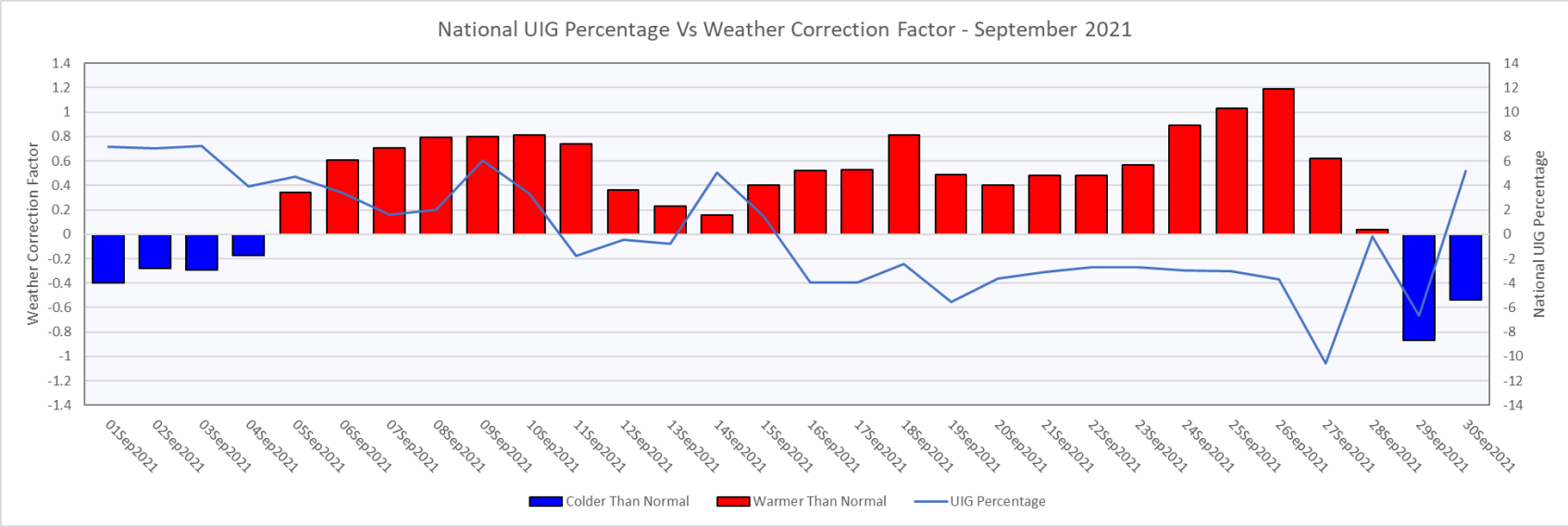
- There were periods of high UIG percentages during May 2021 and low negative UIG percentages during September 2021, which coincide with periods of colder than normal, and warmer than normal weather respectively.
- Similar weather patterns during Winter do not seem to impact UIG levels, potentially hinting that 'Weather Correction Modelling Error' is contributing to UIG levels during shoulder periods. Strand 3 analysis will investigate these periods further.

Daily observed UIG – May 2021



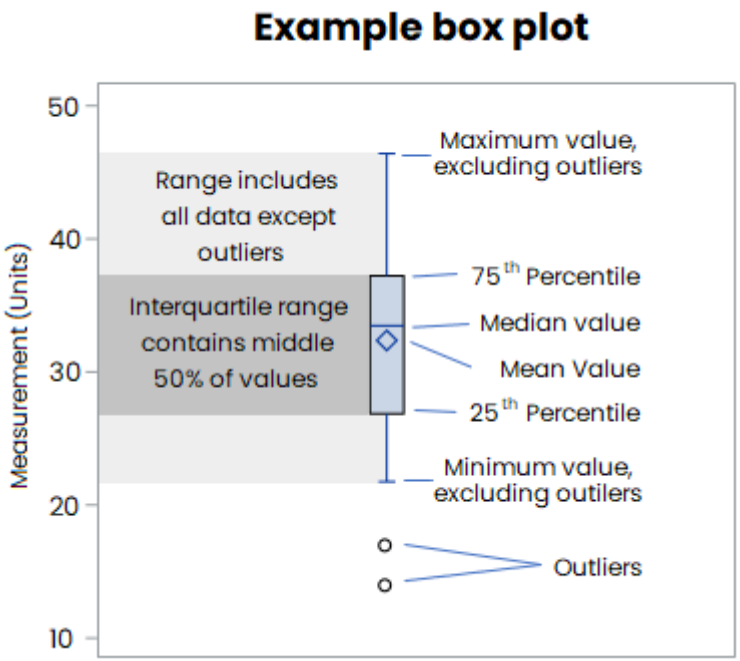
- As observed during Strand 1 analysis, May 2021 was colder than expected when compared against the Seasonal Normal CWV, 25 of 31 Gas days in May were colder than the Seasonal Normal basis.
- Although the nation was not in a national lockdown, local lockdowns and some national restrictions persisted throughout all of May, including over the May Bank Holiday (May 01st to May 09th).
- Strand 3 to investigate the accuracy of the NDM profiles during this period.

Daily observed UIG – September 2021



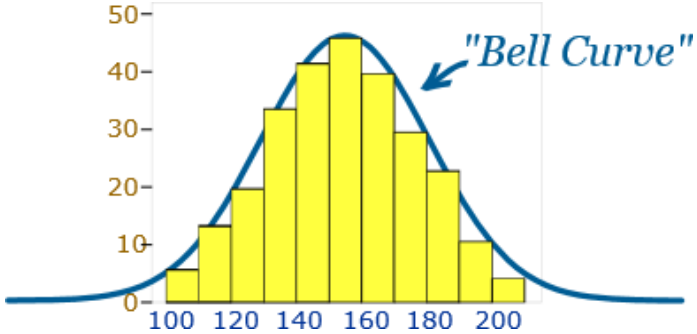
- September 2021 was ranked as the 3rd warmest September since CWV records began (Gas Year 1960/61 onwards). 24 of 30 Gas days were warmer than Seasonal Normal
- There was a period of sustained negative UIG during the second half of September coinciding with a period of warmer than normal weather conditions
- Strand 3 to investigate the accuracy of the NDM profiles during this period.

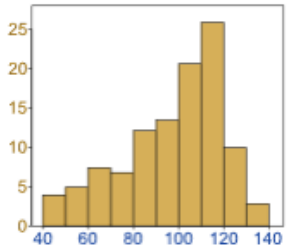
Methods used to assess UIG: Boxplot

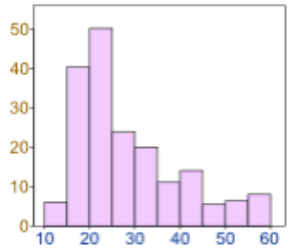


Methods used to assess UIG cont…

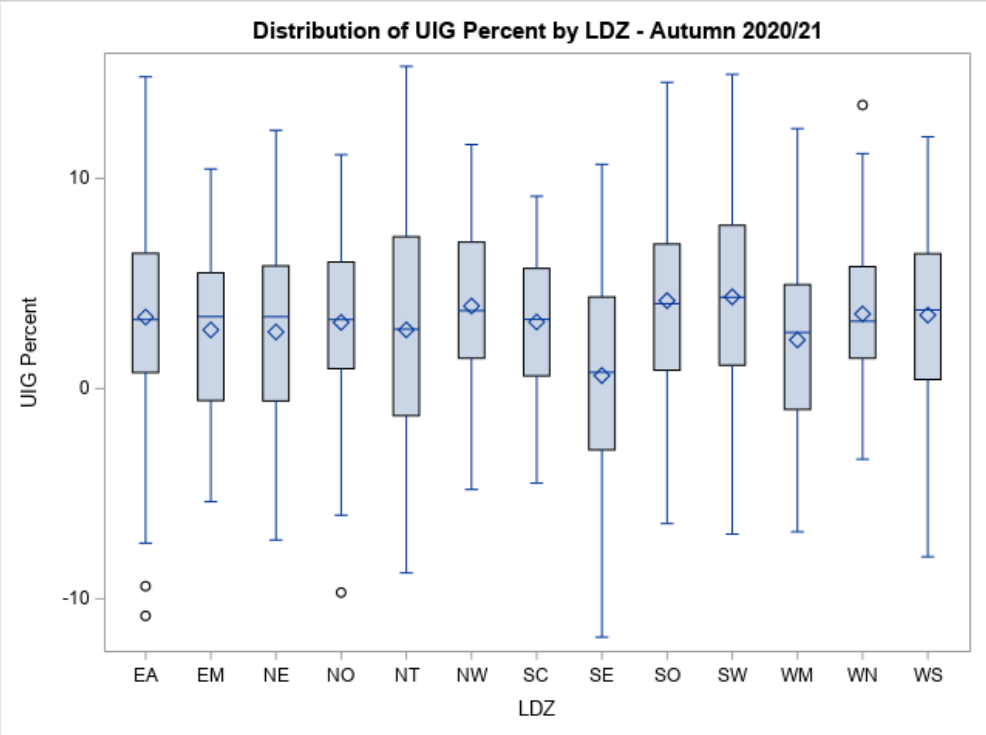
- Assess the Distribution (spread) of UIG.
- Data can be spread in different ways:
  - Symmetrical, with no bias left or right (normal)
  - Skewed to the left – a greater proportion of the measurements lie to the left of the peak value
  - Skewed to the right – a greater proportion of the measurements lie to the right of the peak value







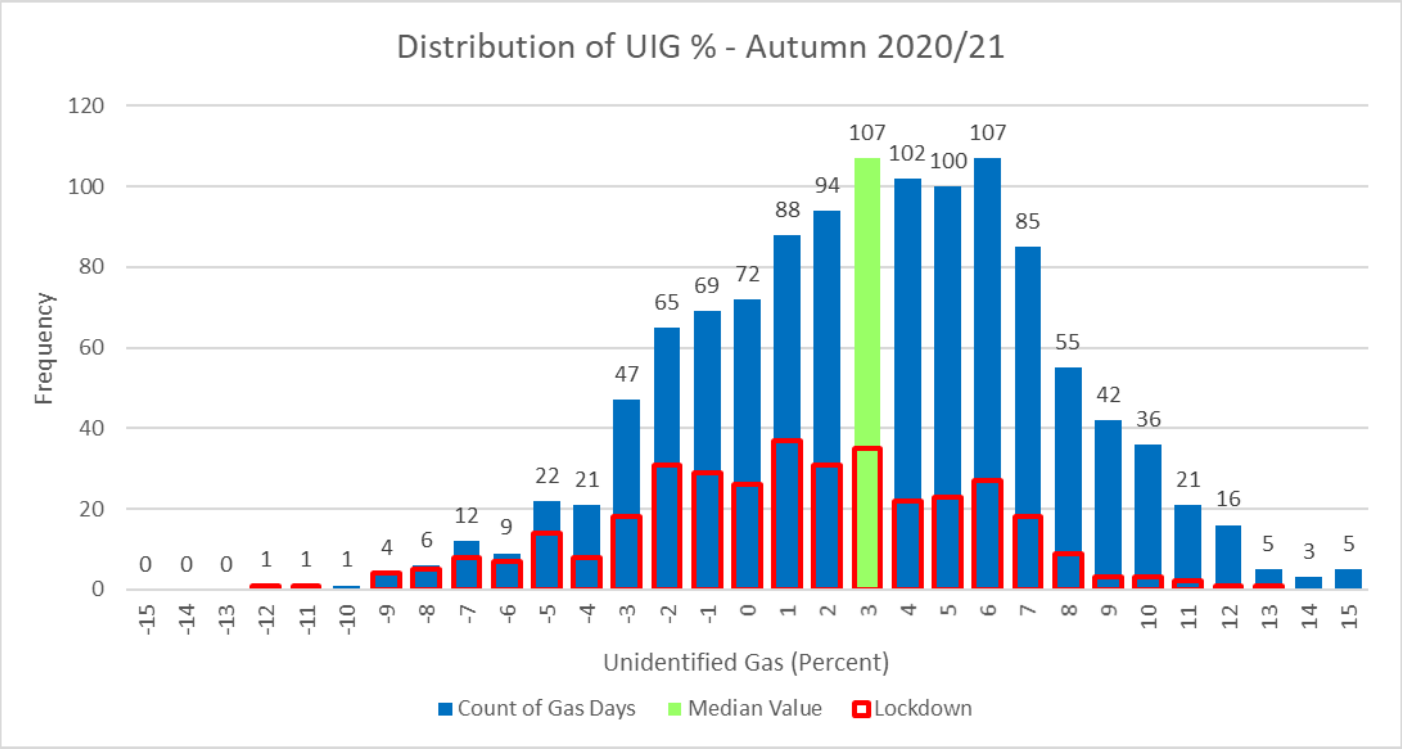
Distribution of UIG – Autumn 2020/21



- Average UIG values during the period Oct'20 to Dec'20 range from 0.62% in LDZ SE to 4.36% in LDZ SW
- All LDZs experienced a positive average UIG during Autumn
- UIG distributions tend to be fairly similar across LDZs ranging roughly between -10% and 15%
- Average daily (absolute) UIG Volume during Autumn was 6.3 GWh

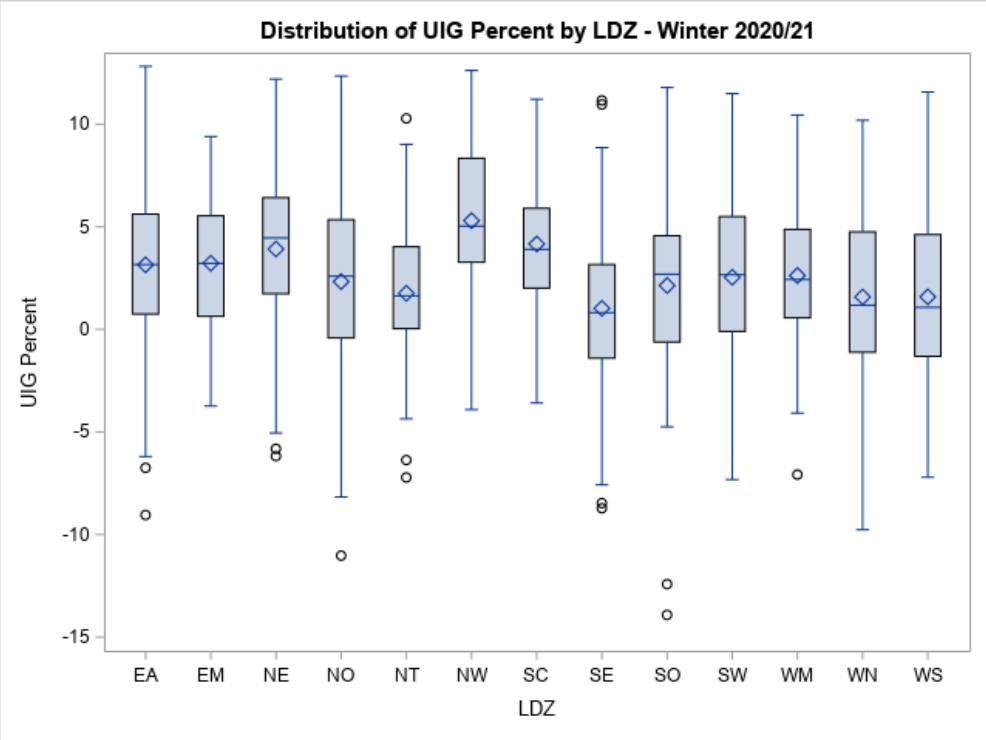
Average UIG% by LDZ – Autumn												
EA	EM	NE	NO	NT	NW	SC	SE	SO	SW	WM	WN	WS
3.40%	2.79%	2.69%	3.15%	2.79%	3.93%	3.17%	0.62%	4.18%	4.36%	2.32%	3.55%	3.50%

UIG Analysis – Autumn 2020/21



- The average UIG percentage across all LDZs during Autumn was 3.12%, the median value was 3.29%
- 95% of UIG values fell between –5% and 11%
- The national lockdown during Autumn lasted from 5th Nov 2020 to 2nd Dec 2020. An average UIG value of 1.17% was observed during this period, compared to 3.96% when not in lockdown.

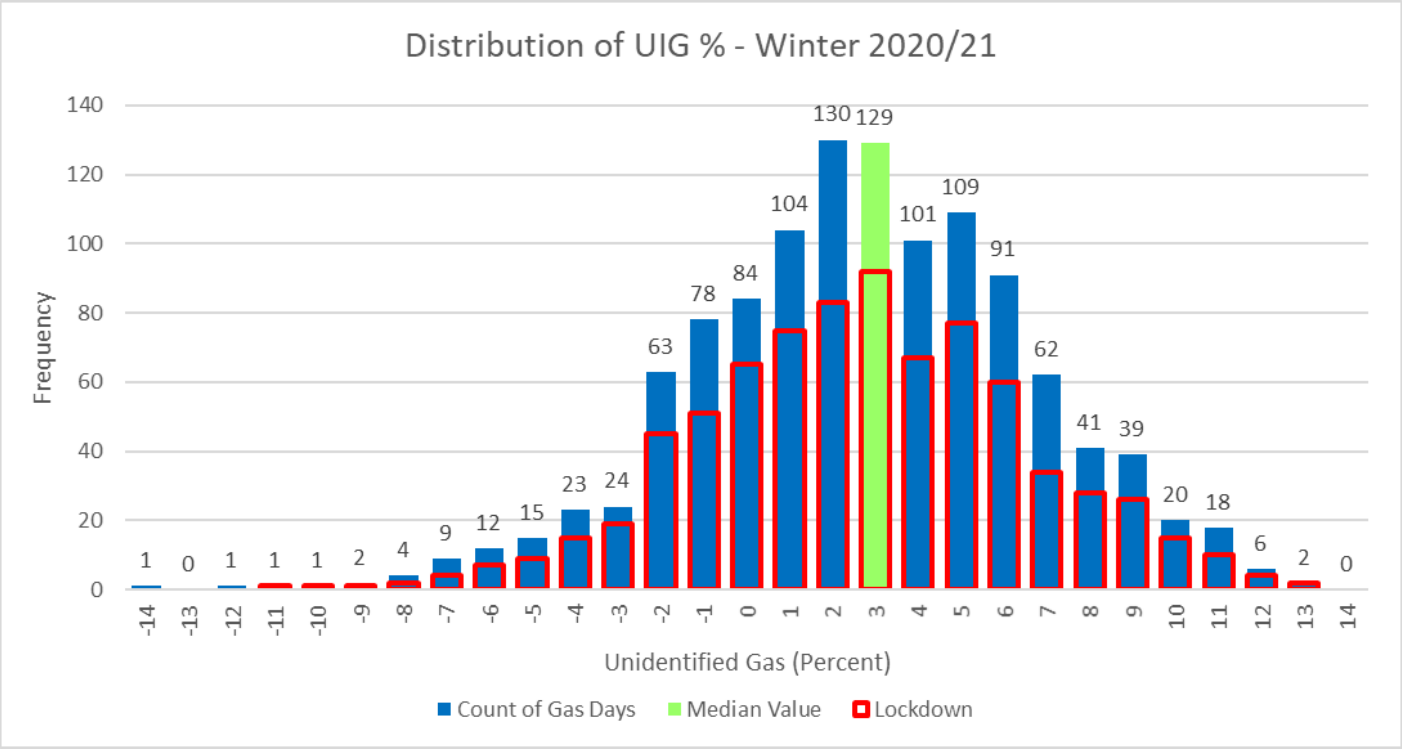
Distribution of UIG – Winter 2020/21



- Average UIG values during the period January'21 to March'21 ranged from 1.02% in LDZ SE to 5.29% in LDZ NW
- UIG values at LDZ level generally tended to range from -10% to slightly above 10% with a few outliers observed in the negative ranges
- All LDZs had a positive average UIG percentage during Winter
- Average daily (absolute) UIG Volume during Winter was 7.4 GWh

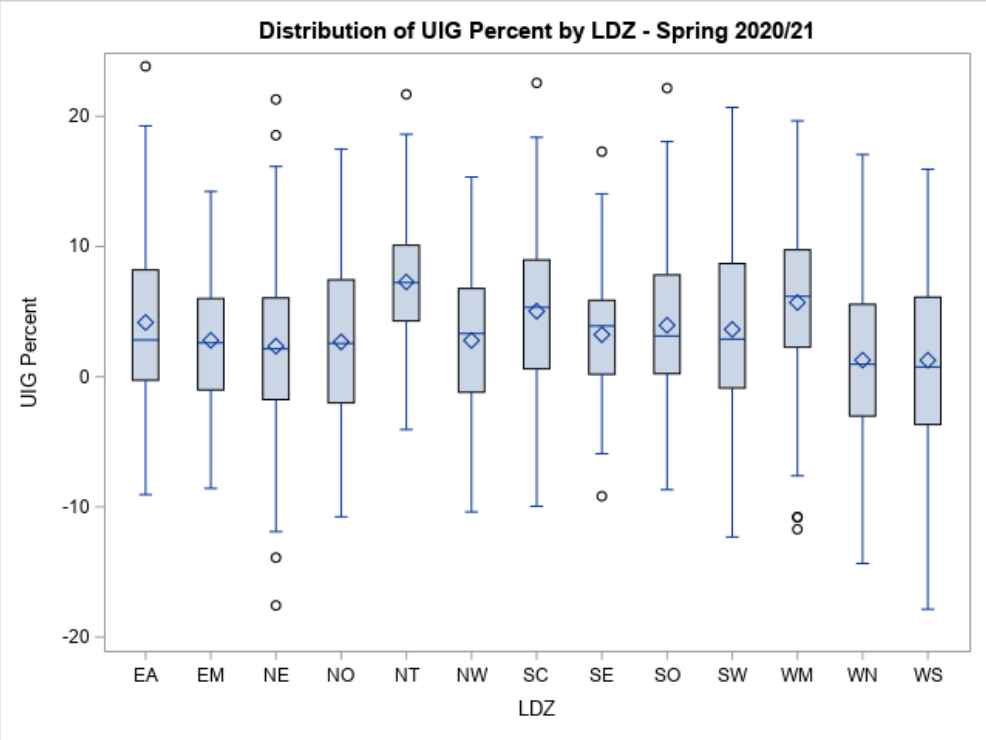
Average UIG% by LDZ – Winter												
EA	EM	NE	NO	NT	NW	SC	SE	SO	SW	WM	WN	WS
3.15%	3.22%	3.91%	2.33%	1.76%	5.29%	4.16%	1.02%	2.14%	2.54%	2.62%	1.58%	1.59%

UIG Analysis – Winter 2020/21



- The average UIG percentage across all LDZs during Winter was 2.72%, the median value was 2.78%.
- The average daily UIG value during the lockdown period was 2.69%
- 95% of UIG values fell between –5% and 11%
- The Majority of winter was under a national lockdown, which began on 6th Jan 2021, restrictions began to be lifted on 7th Mar 2021

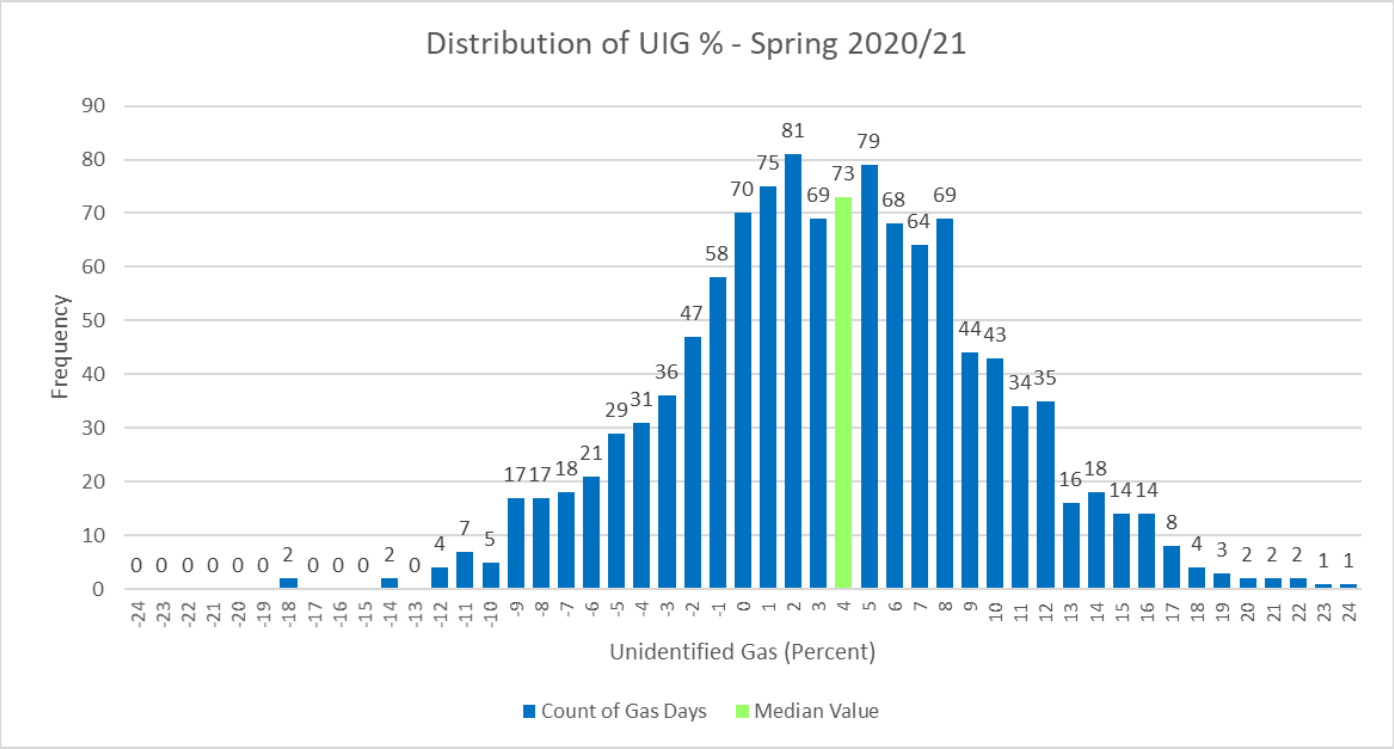
Distribution of UIG – Spring 2020/21



- Average UIG values for the period April'21 to June'21 range from 1.26% in LDZ WS to 7.27% in LDZ NT
- All 13 LDZs had a positive average UIG During Spring
- Upper ranges during Spring reach closer to 20%, potentially due to colder than usual weather conditions present throughout these months
- The highest recorded daily UIG value was observed in LDZ EA on 8th May 2021, a value of 23.84%
- Average daily (absolute) UIG Volume during Spring was 5.8 GWh

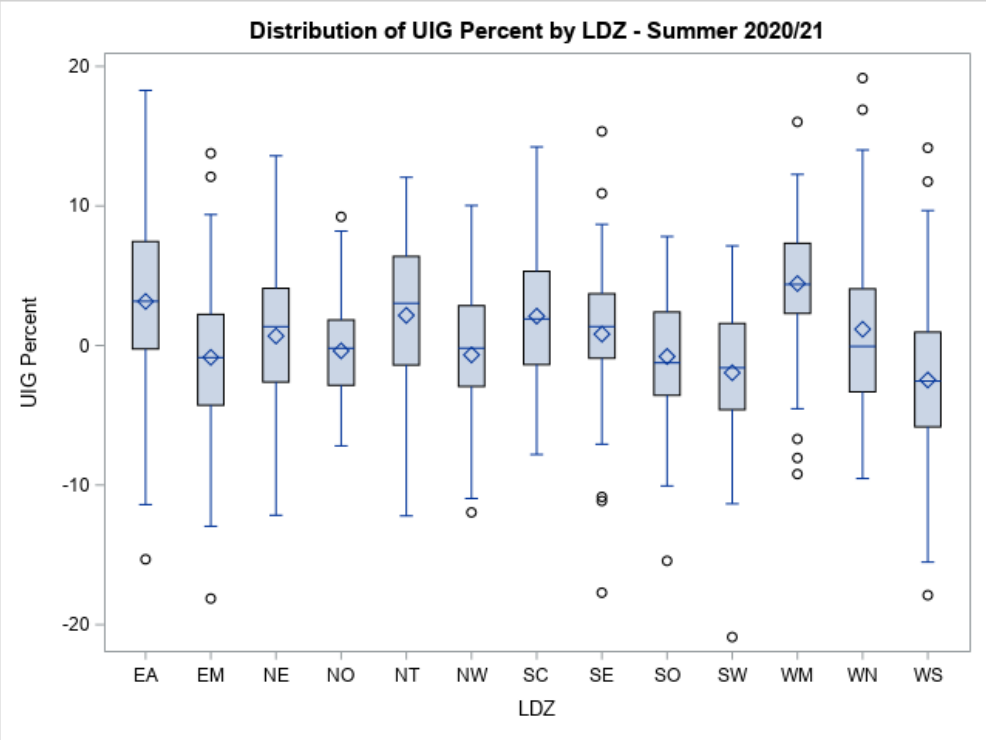
Average UIG% by LDZ – Spring												
EA	EM	NE	NO	NT	NW	SC	SE	SO	SW	WM	WN	WS
4.16%	2.79%	2.34%	2.67%	7.27%	2.79%	5.03%	3.23%	3.95%	3.64%	5.70%	1.27%	1.26%

UIG Analysis – Spring 2020/21



- The average UIG percentage across all LDZs during Spring was 3.53%, the median value was 3.59%
- 95% of UIG values fell between –8% and 16%
- Despite not being in full national lockdown, some restrictions still persisted
- Restrictions were gradually lifted before all legal limits on social contact were removed on 21st June

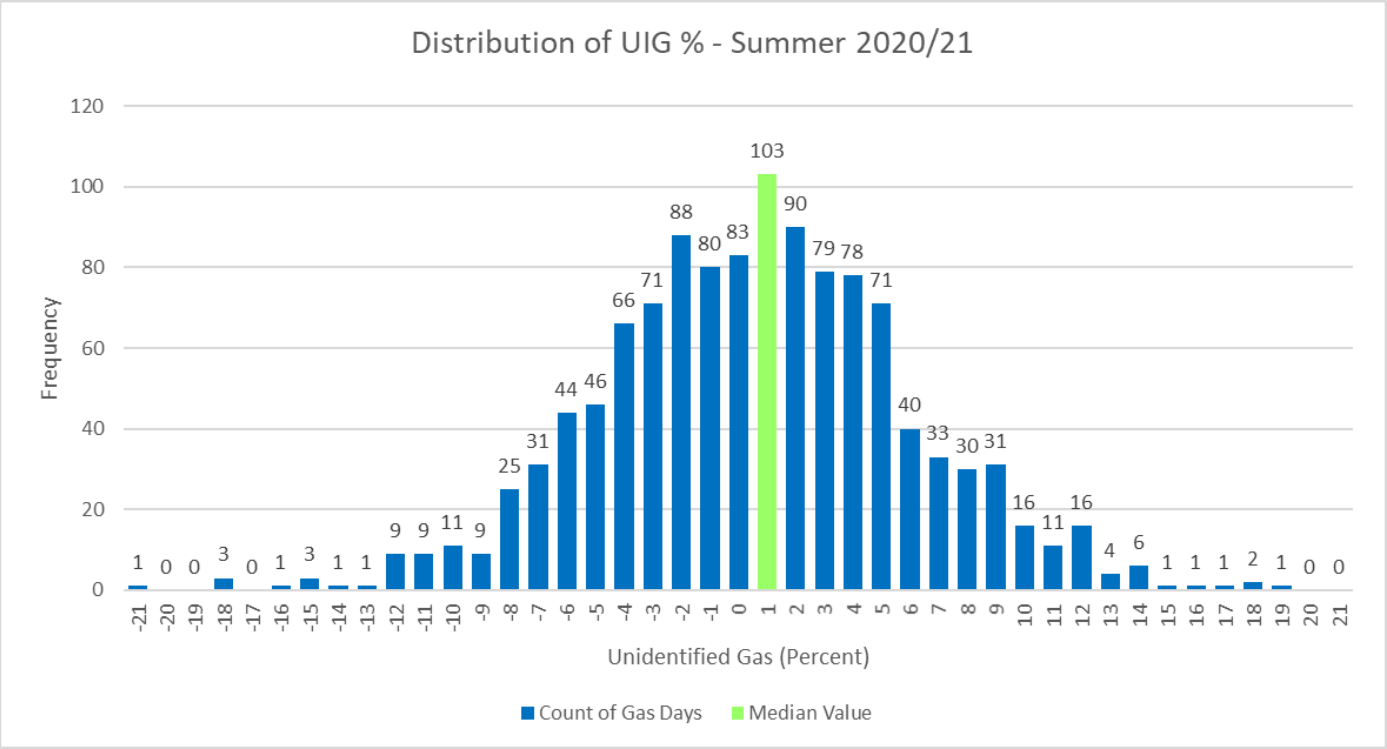
Distribution of UIG – Summer 2020/21



- Average UIG values for the period July'21 to September'21 range from -2.47% in LDZ WS to 4.44% in LDZ WM
- 7 of 13 LDZs had a positive average daily UIG during Summer
- The lowest recorded daily UIG value was observed in LDZ SW on 27th Sep 2021, a value of -20.98%
- Average daily (absolute) UIG volume during Summer was 2.2 GWh

Average UIG% by LDZ - Summer												
EA	EM	NE	NO	NT	NW	SC	SE	SO	SW	WM	WN	WS
3.16%	-0.85%	0.68%	-0.38%	2.16%	-0.67%	2.10%	0.81%	-0.79%	-1.95%	4.44%	1.17%	-2.47%

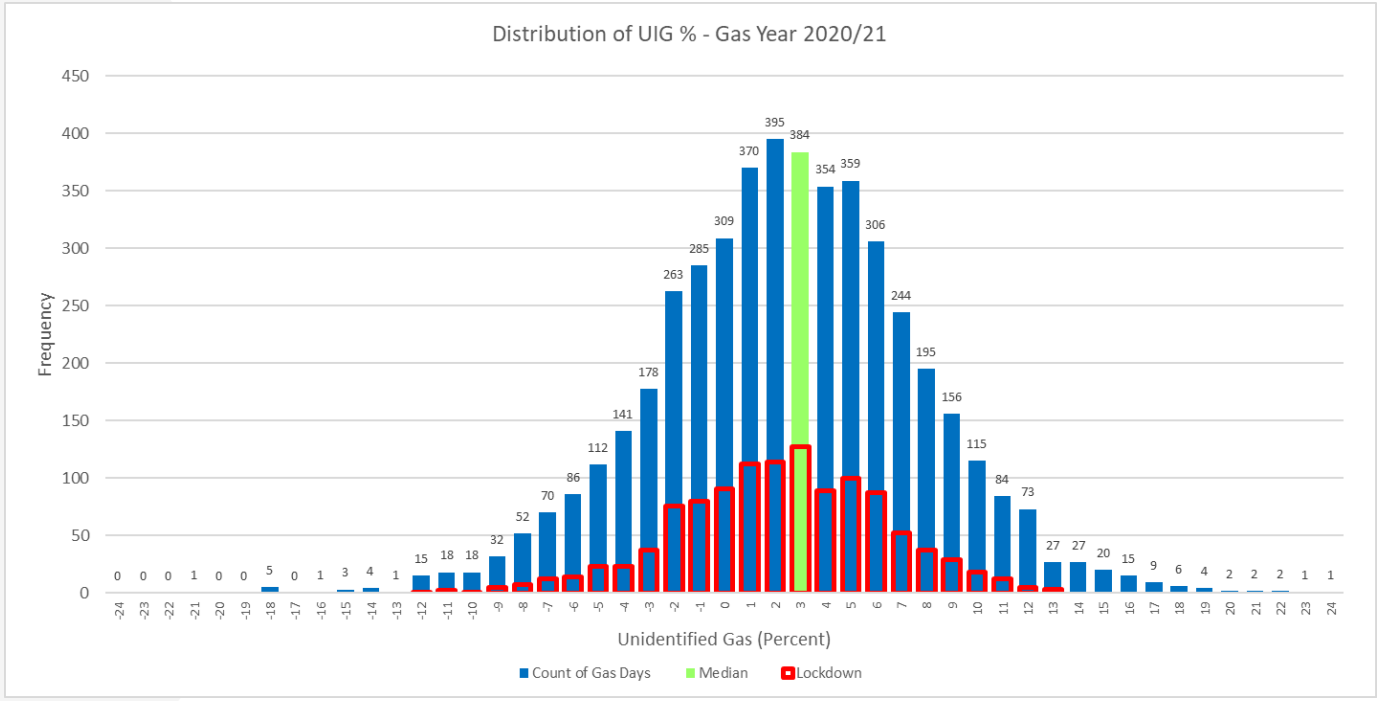
UIG Analysis – Summer 2020/21



- The average UIG percentage across all LDZs during Summer was 0.57%, the median value was 0.63%
- 95% of UIG values fell between –10% and 12%
- Data appears fairly evenly distributed either side of the Median value

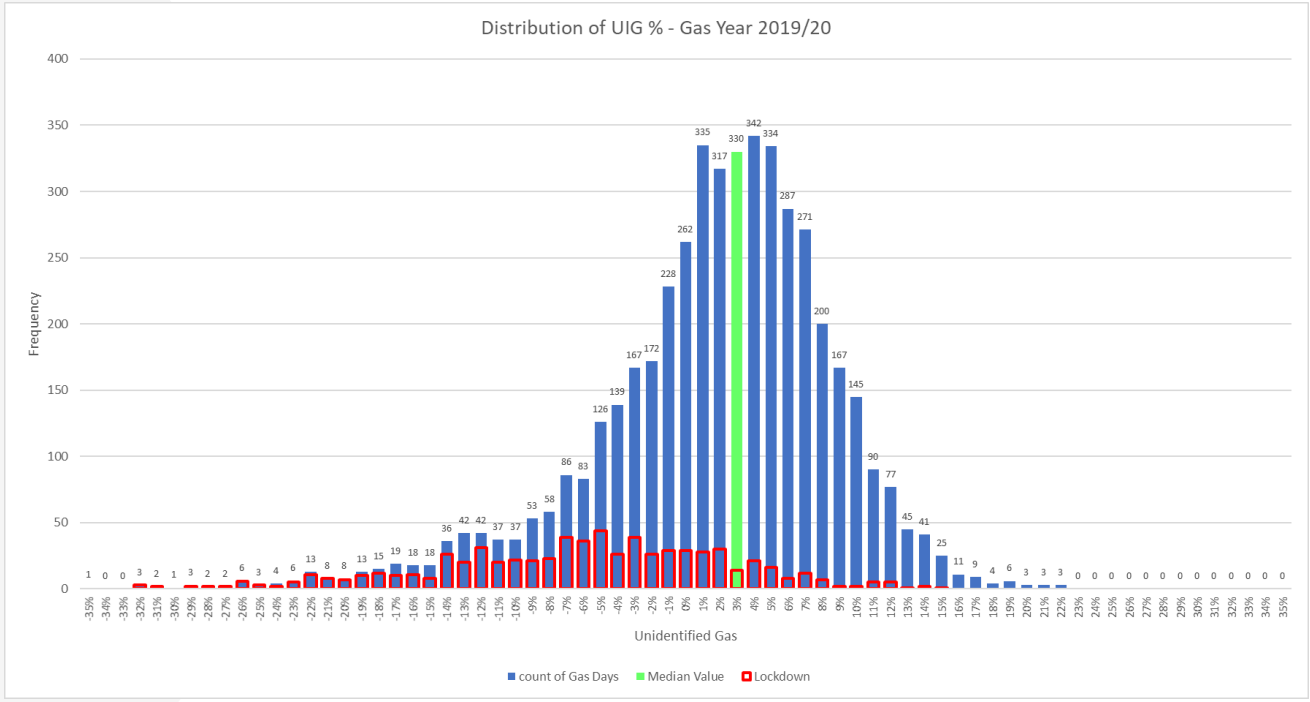
UIG Analysis Gas Year 2020/21

- The average UIG across all LDZs for Gas Year 2020/21 was 2.48%, the Median value was 2.54%
- UIG across the entire Gas Year appears evenly distributed with no clear underlying bias
- The subset of Gas Days within the defined lockdown period appear to follow a similar distribution to that of the full Gas Year

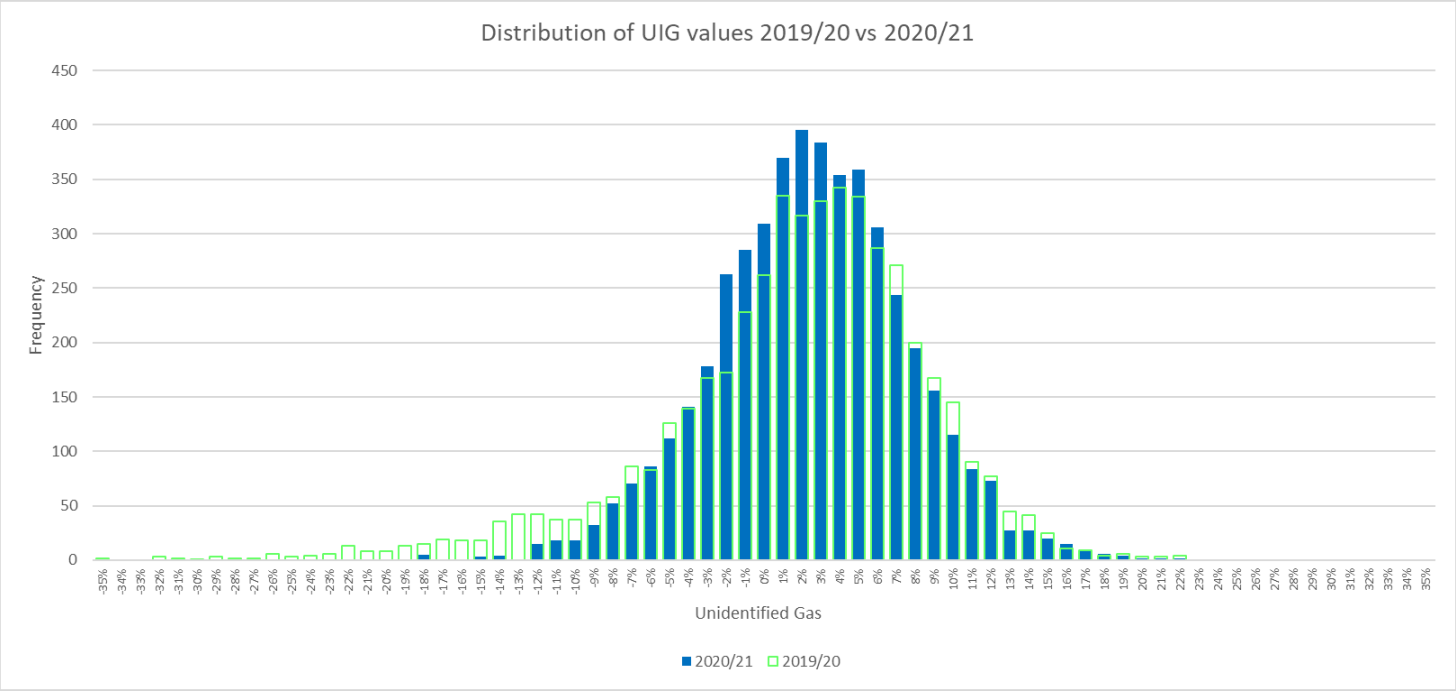


UIG Analysis Gas Year 2019/20

- The average UIG across all LDZs for Gas Year 2019/20 was 1.64%. The Median value was 2.53%
- The graph appears to show a slight negative skew, with the Median value being higher than the average, this is partly due to the increased number of negative UIG Gas Days during the first Lockdown period.



UIG Comparison Gas Years 2019/20 and 2020/21



- The distribution of UIG in 2020/21 is similar to that seen in 2019/20. There is less of a tail towards the highly negative UIG values which were largely caused by the initial national lockdown due to the COVID-19 pandemic in March 2020.

Conclusions

- Average daily national UIG (at D+5) has increased slightly since Gas Year 2019/20, moving from 1.91% to 2.65%
- The following table shows the daily national average, as well as the highest and lowest average UIG value at an LDZ level by season:

Season	National Daily Average	Lowest aboslute average UIG (LDZ)	Highest aboslute average UIG (LDZ)
Autumn	3.03%	0.62 % (SE)	4.36% (SW)
Winter	2.98%	1.02% (SE)	5.29% (NW)
Spring	3.93%	1.25% (WS)	7.27% (NT)
Summer	0.70%	-0.38% (NO)	4.44% (WM)

- When compared to other seasons, average daily UIG levels tended to be lower during Summer.
- The shape of the distribution of UIG is similar to the previous gas year. Effects of National Lockdowns were not as evident in Gas Year 2020/21 as they were in 2019/20 when a large number of negative UIG values were observed.
- Strand 3 to investigate further the accuracy of the NDM profiles during May and September 2021.
- Supporting document containing full examples and commentary for each Strand to be published by end of year. This will also be used as Section 12 of next year's NDM Algorithms Booklet.
- Are there any different approaches to analysis in Strands 1 and 2 which would be useful for DESC to see in future?