Demand Estimation Sub Committee

NDM Algorithm Performance (Gas Year 2016/17)

21st November 2017

Background

- The implementation of Project Nexus on 1st June 2017 introduced a revised NDM demand formula, meaning some of the previous Algorithm Performance measures became redundant

- Discussions took place at DESC meetings during the build up to Nexus implementation which concluded on the following strands:
  - Strand 1 – Weather Analysis
  - Strand 2 – Unidentified Gas Analysis
  - Strand 3 – NDM Daily Demand Analysis
  - Strand 4 – Reconciliation Analysis

Objective

- Where possible, the aim of each analysis strand is to:
  - Provide statistical measures of performance as well as visual representations
  - Develop a more flexible process for Algorithm Performance, allowing us to adapt the data summaries we analyse and how results are presented
  - Carry out ‘regional’ and ‘year on year’ comparisons

- The purpose of Algorithm Performance is to:
  - Provide confidence in the NDM Supply Meter Point Demand formula
  - Identify possible areas of improvement for future demand modelling

- Objective of today’s session is to review Strands 1 and 2
  - Analysis of Strands 3 & 4 are to follow at future DESC meetings

NDM Supply Meter Point Demand formula

The revised NDM demand formula (effective from 1st June 2017) is shown below:

$$SPD_t = ((AQ/365) \times ALP_t \times (1 + (DAF_t \times WCF_t)))$$

where:

AQ = Annual Quantity

ALP_t = Annual Load Profile

DAF_t = Daily Adjustment Factor

WCF_t = Weather Correction Factor

Further detail on the above parameters can be found in the ‘NDM Demand Estimation Methodology’ document

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Strand 1 – Weather Analysis

Background:

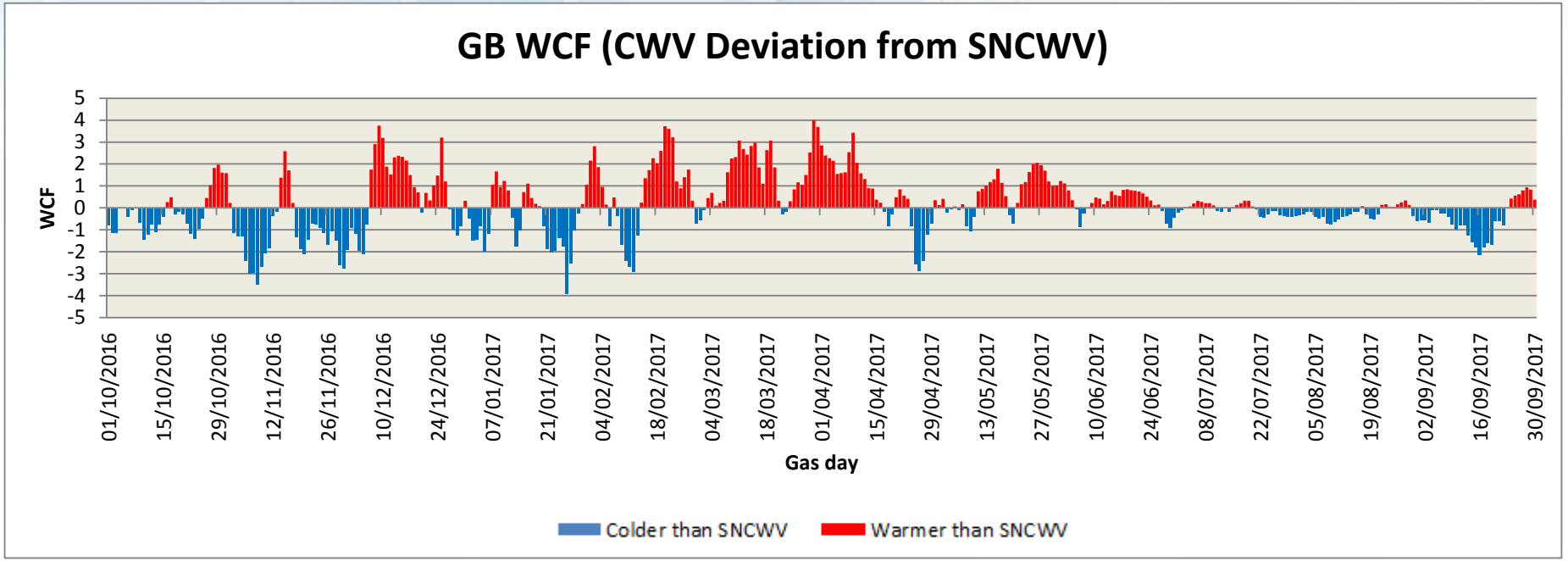
- The observed weather conditions on each day and LDZ (expressed as the CWV) influences the NDM gas demand derived by the allocation formula.

Objective:

- Share information on the observed weather conditions for Gas Year 2016/17
- Identify periods of unusual weather throughout the Gas Year which may help give context to further strands of analysis

Note: In order to derive charts/summaries depicting a national view, ‘GB CWV’ and ‘GB SNCWV’ values have been derived using weightings based on LDZ throughput over the five year period 2009 to 2013

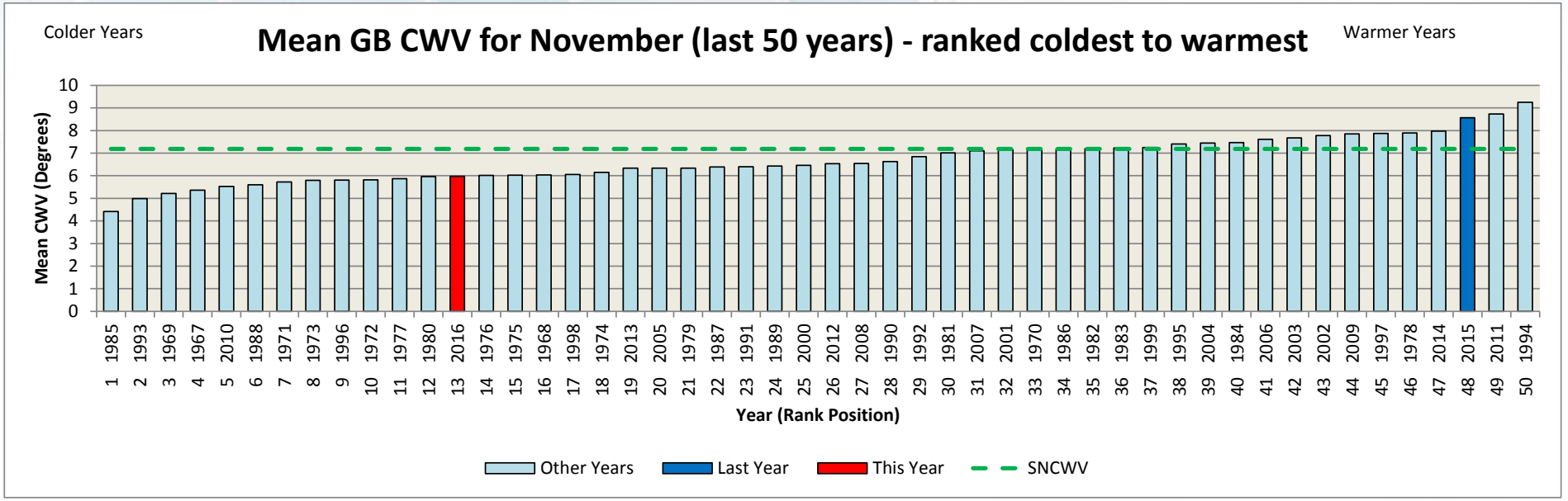
Strand 1 – Weather Analysis: Daily Observations



- Chart shows daily comparisons of CWV vs SNCWV throughout Gas Year 2016/17
- Table shows min and max deviation of CWV from SNCWV by month

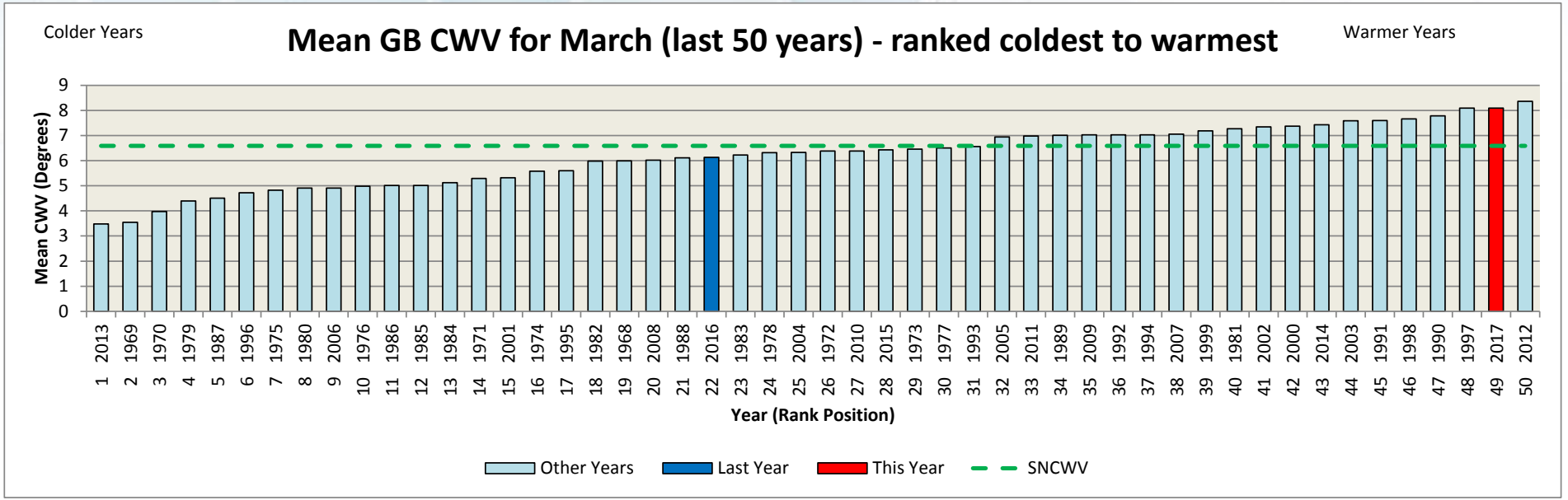
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Max	+1.97	+2.59	+3.75	+1.66	+3.72	+3.99	+3.43	+2.05	+1.23	+0.33	+0.34	+0.93
Min	-1.43	-3.48	-2.09	-3.93	-2.90	-0.55	-2.86	-1.07	-0.88	-0.43	-0.75	-2.13

Strand 1 – Weather Analysis: Monthly Assessment



- Chart shows overall CWV assessment by month for November
- November 2016 was much colder than the current seasonal normal overall
- Majority of individual days were colder than normal
- Ranked as 13th coldest November over the past 50 years

Strand 1 – Weather Analysis: Monthly Assessment



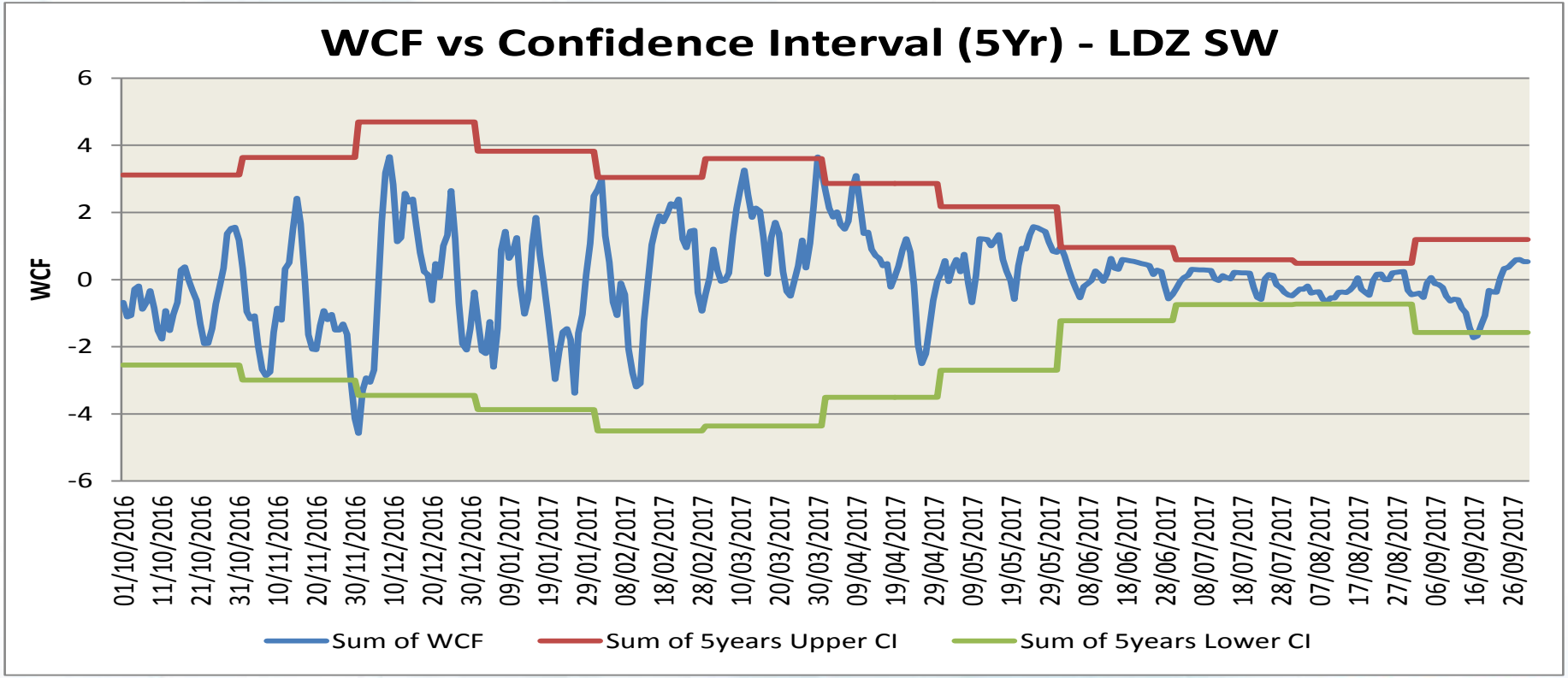
- Chart shows overall CWV assessment by month for March
- March 2017 was much warmer than the current seasonal normal overall
- Almost all individual days were warmer than normal
- Ranked 2nd warmest March in the past 50 years

Strand 1 – Weather Analysis: Confidence Intervals Analysis

- Confidence Interval analysis has been performed on observed WCF values during Gas Year 2016/17
- The confidence intervals were calculated for each month and LDZ based on 5 years of history (i.e. Gas Years 2011/12, 2012/13, 2013/14, 2014/15 & 2015/16)
- An observation is considered unusual if it is far away from the mean
- The 95% CI was calculated by using the mean and standard deviation for the 5 years and we can use these intervals to identify when the WCF is regarded as unusual

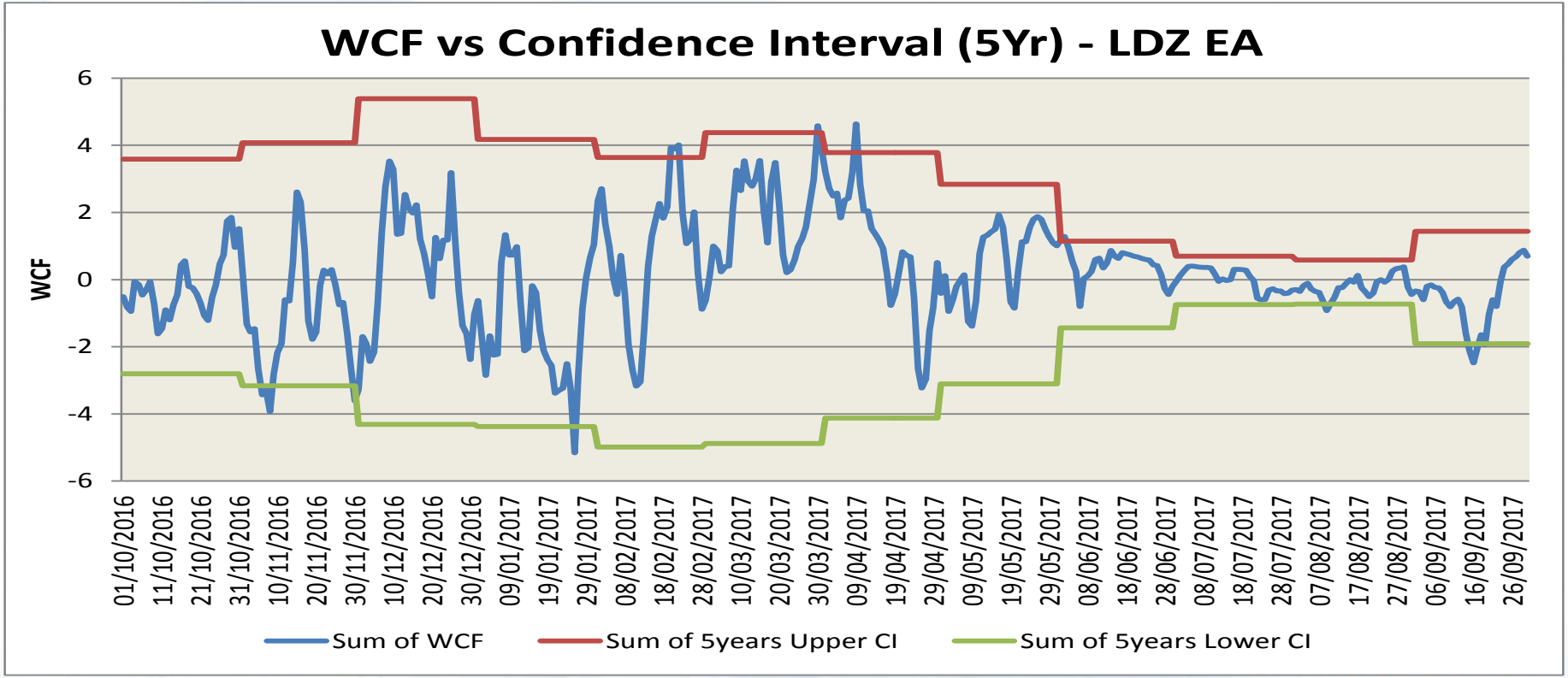
Strand 1 – Weather Analysis: Confidence Intervals Analysis

Example chart of LDZ where most number of WCF values fall within the confidence intervals



Strand 1 – Weather Analysis: Confidence Intervals Analysis

Example chart of LDZ where least number of WCF values fall within the confidence intervals



Strand 1 – Weather Analysis: Confidence Intervals Analysis

Percentage of WCF values within the confidence interval for each LDZ/Month combination

Key: < 95%

Month	SC	NO	NW / WN	NE	EM	WM	WS	EA	NT	SE	SO	SW
Oct'16	100%	100%	100%	100%	100%	100%	94%	100%	100%	100%	100%	100%
Nov'16	80%	90%	80%	87%	87%	93%	90%	87%	87%	87%	87%	97%
Dec'16	100%	100%	100%	100%	100%	100%	87%	100%	100%	100%	100%	97%
Jan'17	94%	100%	97%	100%	100%	100%	100%	97%	97%	97%	97%	100%
Feb'17	93%	93%	93%	89%	89%	89%	100%	89%	89%	89%	93%	100%
Mar'17	100%	100%	100%	100%	100%	100%	100%	97%	97%	97%	100%	97%
Apr'17	97%	97%	100%	97%	97%	97%	100%	97%	97%	97%	97%	97%
May'17	94%	100%	100%	100%	100%	100%	97%	100%	100%	100%	100%	100%
Jun'17	100%	97%	100%	97%	93%	97%	100%	93%	93%	93%	97%	97%
Jul'17	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Aug'17	100%	100%	97%	100%	97%	100%	100%	97%	97%	97%	90%	100%
Sep'17	100%	100%	100%	100%	100%	100%	93%	87%	87%	87%	87%	93%

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Strand 1 – Weather Analysis: Conclusions

- Overall, the observed weather during Gas Year 2016/17 when compared to current seasonal normal is as follows:
  - Quarter 1 (Oct'16 to Dec'16) was generally colder
  - Quarter 2 (Jan'17 to Mar'17) was generally warmer
  - Quarter 3 (Apr'17 to Jun'17) was generally warmer
  - Quarter 4 (Jul'17 to Sep'17) was generally colder
- The stand out periods of unusual weather were:
  - November'16 – most days in month were much colder than normal
  - February'17 – majority of days were much warmer (notably 3 day period of 20th to 22nd)
  - March'17 – 2nd warmest March in 50yrs and almost all individual days were warmer than normal
  - Top 5 unusually colder days: 26th Jan'17; 8th Nov'16; 6th Nov'16; 7th Nov'16 and 12th Feb'17
  - Top 5 unusually warmer days: 30th Mar'17; 9th Dec'16; 20th Feb'17; 31st Mar'17 and 21st Feb'17
- When interpreting the various strands of Algorithm Performance, it is relevant to recall the weather conditions that prevailed during the gas year being analysed

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Strand 2 – UiG Analysis

Background:

- Following Nexus Go-live, UiG is now the balancing figure in each LDZ each day

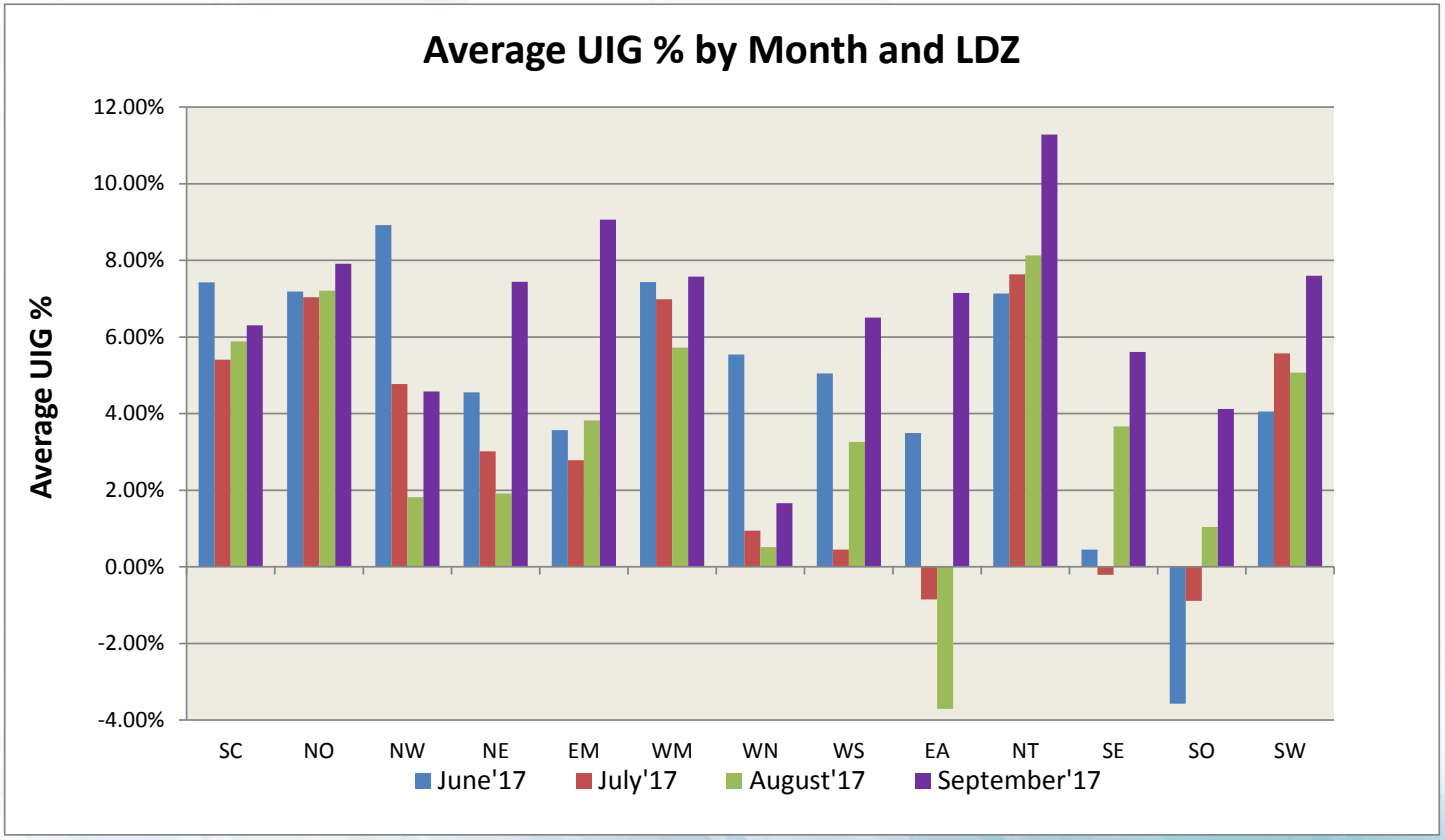
  Unidentified Gas = Total LDZ Throughput – Shrinkage – DM Measurements – NDM Allocation

Objective:

- Report UiG levels for Gas Year 2016/17 (from 1st June 2017)
- Share insights into the causes and impacts of UiG
- Monitor movement of UiG values throughout closeout window

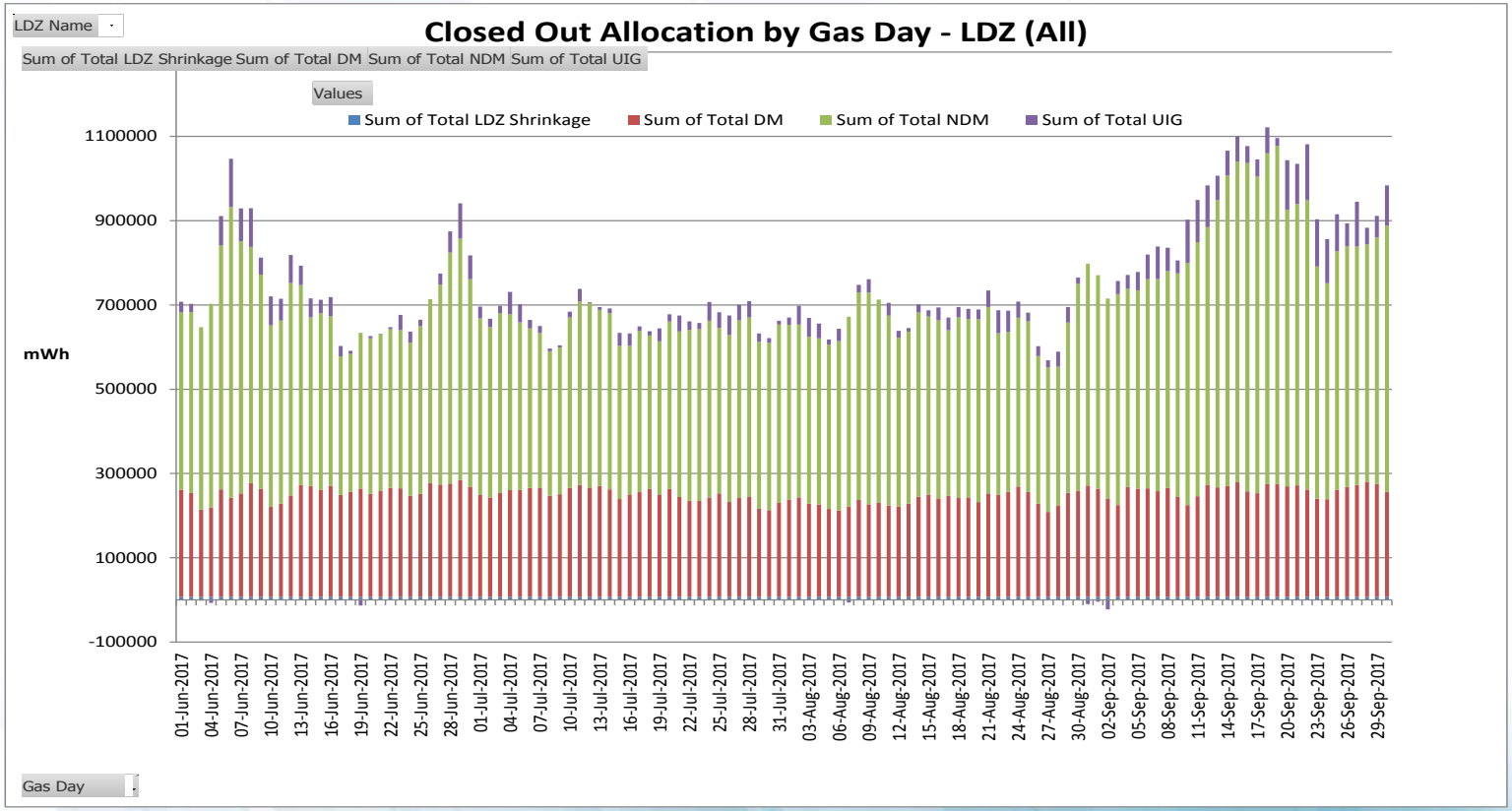
Strand 2 – UiG Analysis: Average UiG

Chart shows monthly average UiG % by LDZ



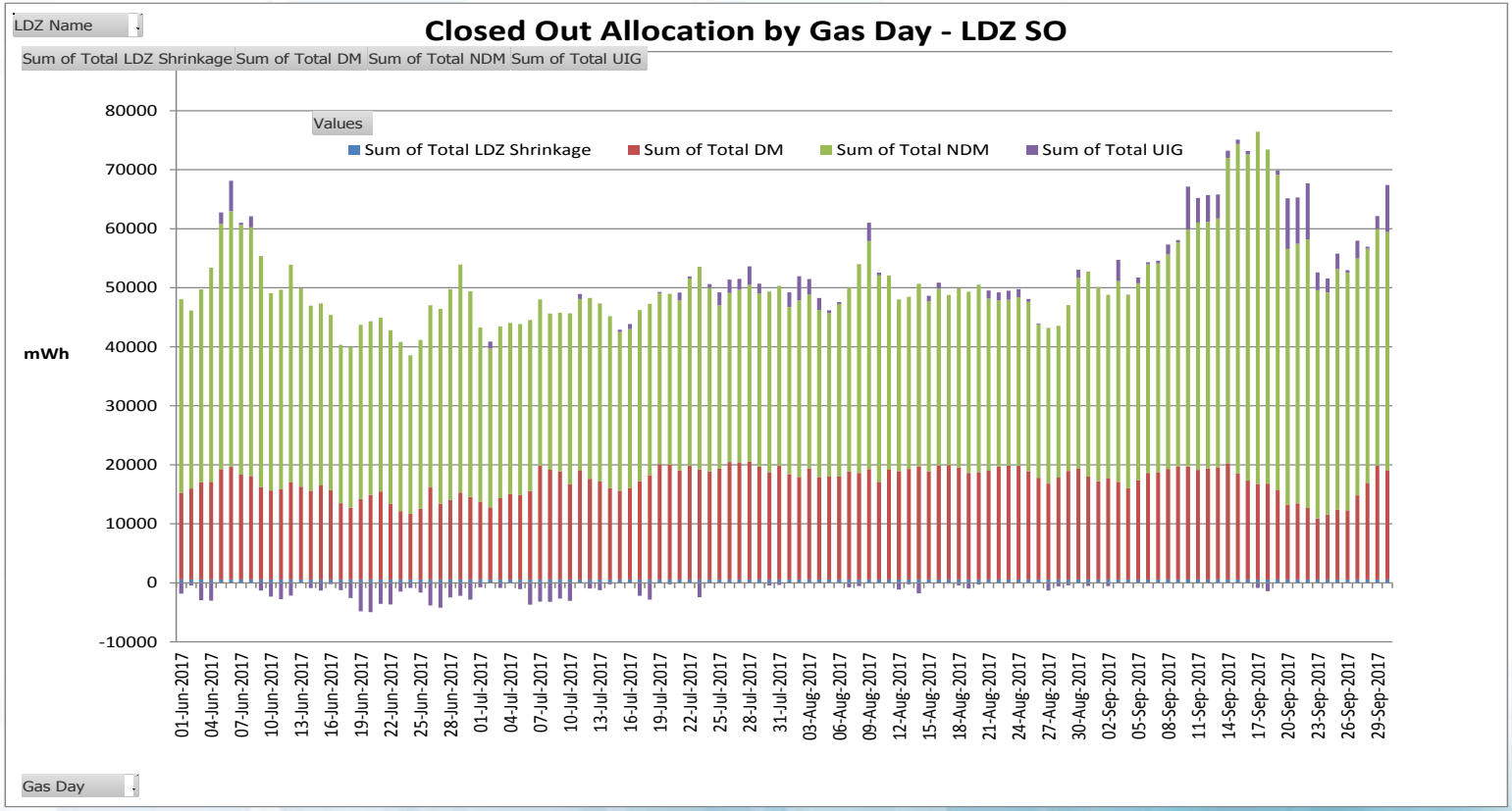
Strand 2 – UiG Analysis: Total Allocation Breakdown

- Chart shows breakdown of total national throughput
- Variation in DMs is evident, NDM Algorithm is taking up much of the daily movement - but not all of it



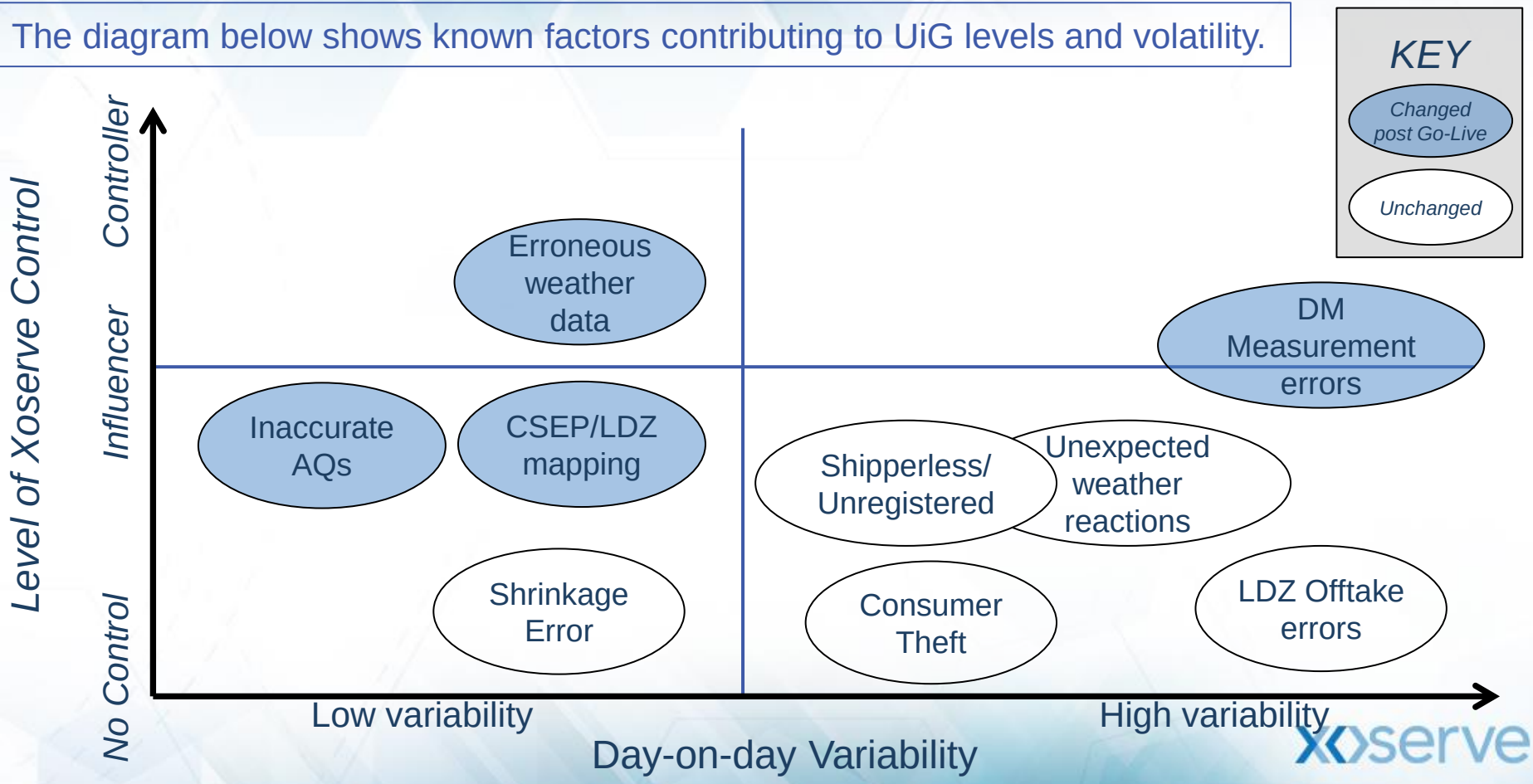
Strand 2 – UiG Analysis: Total Allocation Breakdown

- Chart shows breakdown of total throughput in ‘SO’ LDZ
- Negative UiG is more prominent during the summer period than in other LDZs

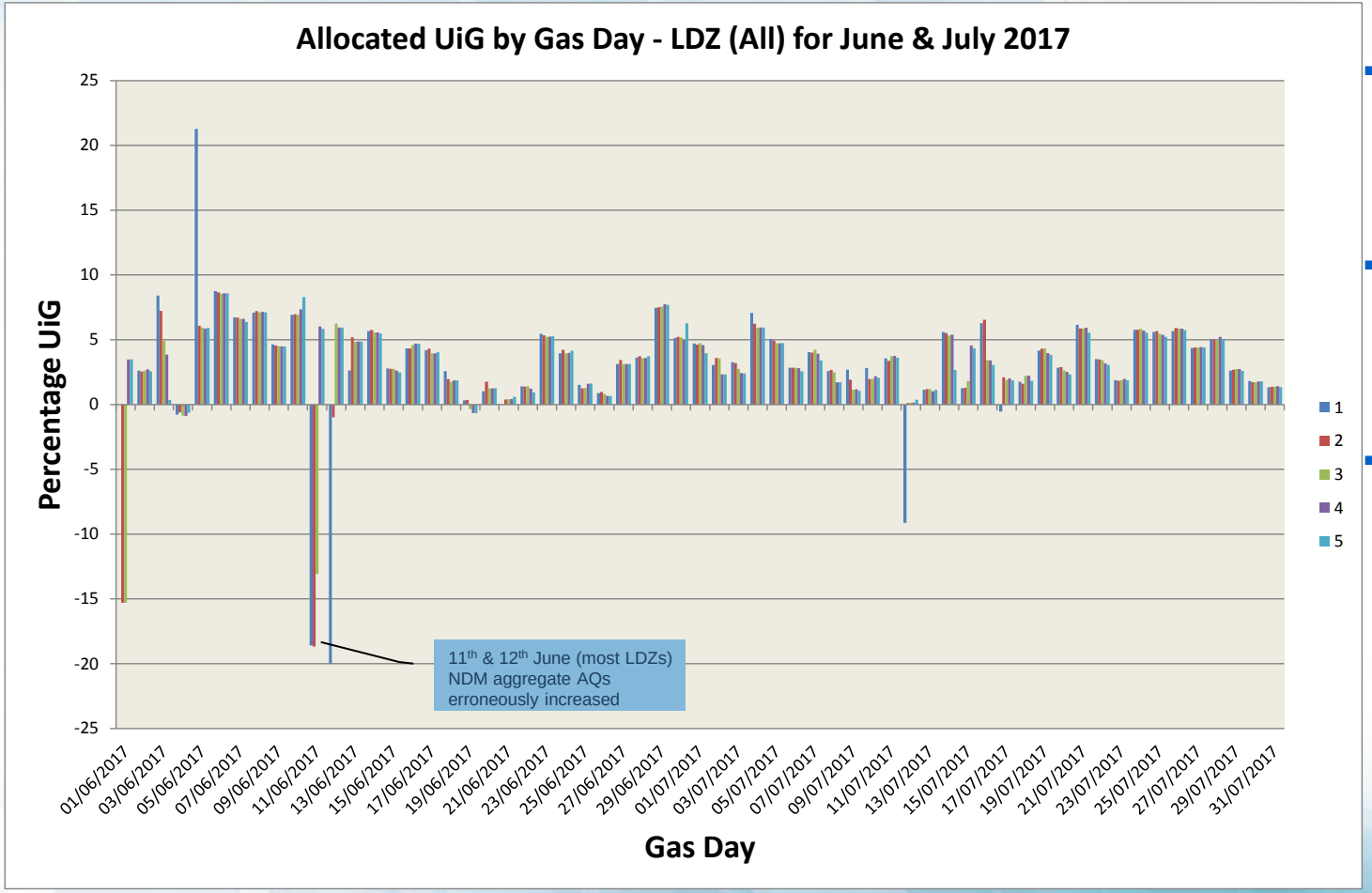


Strand 2 – UiG Analysis: Causes of UiG

The diagram below shows known factors contributing to UiG levels and volatility.

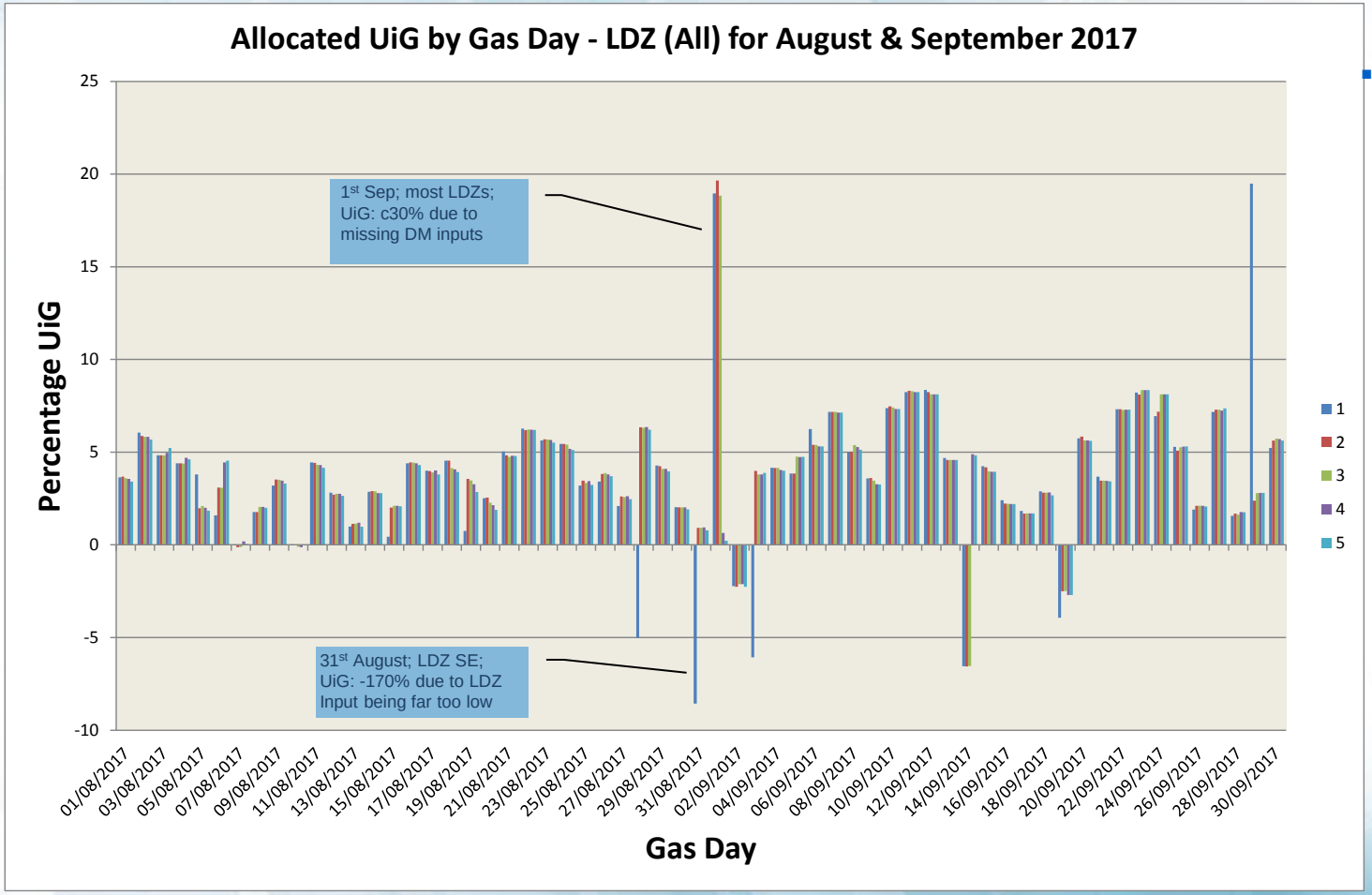


Strand 2 – UiG Analysis: UiG Through Closeout



- Daily UiG levels in each LDZ are monitored throughout the closeout window
- Any suspicious values are investigated in an attempt to resolve within closeout
- Chart shows some of the more obvious issues that were identified with the associated cause (where known)

Strand 2 – UiG Analysis: UiG Through Closeout



- Chart shows some of the more obvious issues that were identified with the associated cause (where known)

Strand 2 – UiG Analysis: Conclusions

- Average UiG (LDZ & Month) has been positive in most cases (Jun'17 to Sep'17)
- Daily UiG is difficult to predict
- UiG magnitude and volatility can be influenced by various elements, including:
  - LDZ Measurement errors
  - DM Measurement errors
    - ongoing project addressing DM read rejections
  - Inaccurate NDM AQs
    - ongoing project to resolve erroneous AQs identified as a result of data feeding rolling AQ calculation
  - Accuracy of NDM Supply Meter Point Demand formula (to be analysed in Strand 3)
  - Erroneous weather data
  - Incorrect LDZ mapping
    - investigation underway to assess impact of sites (CSEPS) which are potentially in the incorrect LDZ

Review Group 0631 continues to assess options to reduce UiG volatility for the industry

Summary and Next Steps

Summary:

- Are there any further areas of analysis for Strands 1 and 2 that should be included going forward?
- Strand 1 & 2 evaluation document published on Joint Office website with full examples

Next Steps:

- NDM Daily Demand Analysis (Strand 3) currently underway and due for discussion at the December'17 DESC meeting

- Reconciliation Analysis (Strand 4) to be discussed at the February'18 DESC meeting due to the additional Strand 3 analysis involving 3rd party data
  - Views are invited as to what detailed analysis DESC would like performed for Strand 4

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