# EVALUATION OF ALGORITHM PERFORMANCE - GAS YEAR 2016/17 STRAND 1 AND STRAND 2

## 1. BACKGROUND

One of the responsibilities of the Demand Estimation Sub Committee (DESC) is to provide a summary of the NDM Algorithm Performance in the preceding year. UNC requirement 'H 1.8.1 (d)' states "DESC will submit to all parties a summary of the Committee's analysis of the performance in the Preceding Year of the End User Categories and Demand Models (applicable in the Preceding Year)".

The analysis is completed once a year in the Autumn, following completion of the gas year and Xoserve performs this role as the common demand estimation service provider.

The implementation of Project Nexus on 1st June 2017 introduced a revised NDM Supply Meter Point Demand formula, meaning some of the original Algorithm Performance measures became redundant. At the DESC meeting on 15th November 2016, the group reviewed four proposed strands of analysis which would help assess the accuracy of the estimated allocations derived by the revised formula. These analysis strands are as follows:

Strand 1 – Weather Analysis

Strand 2 – Unidentified Gas Analysis

Strand 3 – NDM Daily Demand Analysis

Strand 4 – Reconciliation Analysis

## 2. NDM SUPPLY METER POINT DEMAND FORMULA

The revised NDM Supply Meter Point Demand formula (effective from 1st June 2017) used for estimating NDM daily demand 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 ($WVCE_t$ / $SNDE_t$)

$WCF_t$ = Weather Correction Factor ($CWV_t$ – $SNCWV_t$)

In addition to the revised demand formula, 1st June 2017 also saw the introduction of Unidentified Gas or UiG. UiG forms part of daily gas allocation and is calculated as the balancing figure to ensure that within in each LDZ, total input matches total output. UiG is derived as follows:

Total LDZ Energy – (Shrinkage + DM Energy + Total LDZ NDM Energy) = UiG

## 3. STRAND 1: WEATHER ANALYSIS

When interpreting the various strands of Algorithm Performance, it is relevant to recall the weather conditions that prevailed during the gas year being analysed.

The Composite Weather Variable (CWV) is a single measure of daily weather in each LDZ and is a function of actual temperature, wind speed, effective temperature and seasonal normal effective temperature. Further detail on the computation of the CWV can be found in Section 11 of the NDM Algorithm Booklet.

The SNCWV is the Seasonal Normal value of the Composite Weather Variable for the LDZ for the day.

The Weather Correction Factor (WCF) represents the difference between the CWV and the SNCWV for the LDZ and Gas Day.

Please note that in order to derive the weather charts and summaries depicting a national view of weather, 'GB CWV' and 'GB SNCWV' values have been derived using weightings based on LDZ throughput over the five year period 2009 to 2013.

A selection of weather related charts are presented below: Figures S12.1 to S12.12 are bar charts showing the national monthly average CWV for each specific month, ranked coldest to warmest over the past 50 years. Figures S12.13 to S12.24 are charts showing the national daily average CWV values for each specific month and how they compare to SNCWV. Figures S12.25 to S12.36 show daily observed CWV values compared to SNCWV, across each LDZ for the gas year as a whole.

A monthly weather summary for each individual month in the relevant gas year is provided below:

October 2016 was slightly colder than the current seasonal normal overall and ranked 23rd warmest over the past 50 years. The majority of days throughout the month were slightly colder than the current seasonal normal with the most notable exception being the last week of the month which was marginally warmer than normal. CWV deviation from SNCWV across all days in October 2016 ranged from +1.97 to -1.43.

November 2016 was much colder than the current seasonal normal overall, ranking as the 13th coldest November over the past 50 years. The majority of the individual days were colder than normal with the CWV deviation from SNCWV across all days in November 2016 ranging from +2.59 to -3.48.

December 2016 was warmer than the current seasonal normal overall, resulting in it being ranked the 4th warmest December in the last 50 years. With the exception of some days at the beginning and end of the month, most individual days were much warmer than normal. CWV deviation from SNCWV across all days in December 2016 ranged from +3.75 to -2.09.

January 2017 was colder than the current season normal overall and ranked as the 22nd coldest January over the past 50 years. Most of the individual days throughout the month were slightly colder than the current seasonal normal with the most notable cold day being observed on 26th January 2017. CWV deviation from SNCWV across all days in January 2017 ranged from +1.66 to -3.93.

February 2017 was warmer than the current seasonal normal and ranked as the 8th warmest February in the past 50 years. The majority of the individual days throughout the month were much warmer than normal, most notably the 3 day period from 20th to 22nd. CWV deviation from SNCWV across all days in February 2017 ranged from +3.72 to -2.90.

March 2017 was much warmer than the current seasonal normal overall which resulted in it being ranked as the 2nd warmest March in the last 50 years. Almost all the individual days were warmer than normal with the CWV deviation from SNCWV across all days in March 2017 ranging from +3.99 to -0.55.

April 2017 was slightly warmer than the current seasonal normal overall and ranked as the 8th warmest April in in past 50 years. The warmer than normal weather from the previous month continued, with all days during the first half of April being warmer than normal. In contrast, the second half of April was mostly colder than normal, particularly the last week. CWV deviation from SNCWV across all days in April 2017 ranged from +3.43 to -2.86.

May 2017 was marginally warmer than the current seasonal normal but ranked as the 5th warmest May in the past 50 years. The majority of the individual days throughout the month were much warmer than normal, most notably the 5 day period from 24th to 28th (the CWV reached its maximum value in 12 of the 13 LDZs on 26th May 2017). CWV deviation from SNCWV across all days in May 2017 ranged from +2.05 to -1.07.

June 2017 was warmer than seasonal normal overall, ranking 5th warmest in the past 50 years, with the individual days throughout the month being predominantly slightly warmer than normal. CWV deviation from SNCWV across all days for June 2017 ranged from 1.23 to -0.88 and over the period 18th to 22nd June 2017, the CWV reached its maximum value in at least 10 of the 13 LDZs.

July 2017 was slightly colder than the current seasonal normal overall but ranked 16th warmest over the past 50 years. Each of the individual days throughout the month were very close to normal although the CWV reached its maximum in at least 10 of the 13 LDZs on 6th, 18th and 19th July 2017. CWV deviation from SNCWV across all days in July 2017 ranged from +0.33 to -0.43.

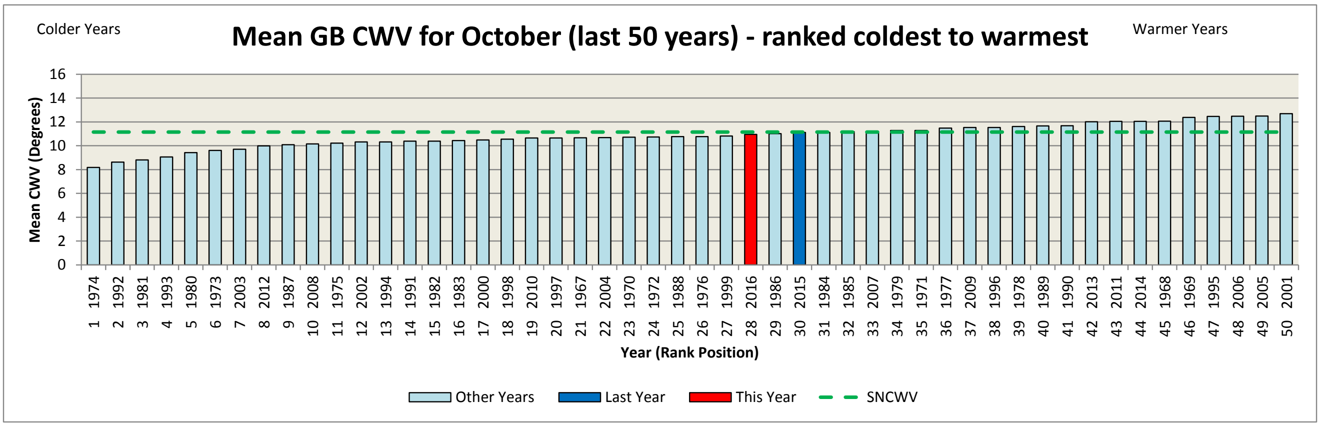
August 2017 was colder than the current seasonal normal overall and ranked as the 23rd coldest August over the past 50 years. Most individual days throughout the month were very close to normal with the CWV deviation from SNCWV across all days in August 2017 ranging from +0.34 to -0.75.

September 2017 was colder than the current seasonal normal overall, ranking as the 19th coldest September in the last 50 years. The majority of the individual days in the month were colder than normal with the CWV deviation from SNCWV across all days in August 2017 ranging from +0.93 to -2.13.

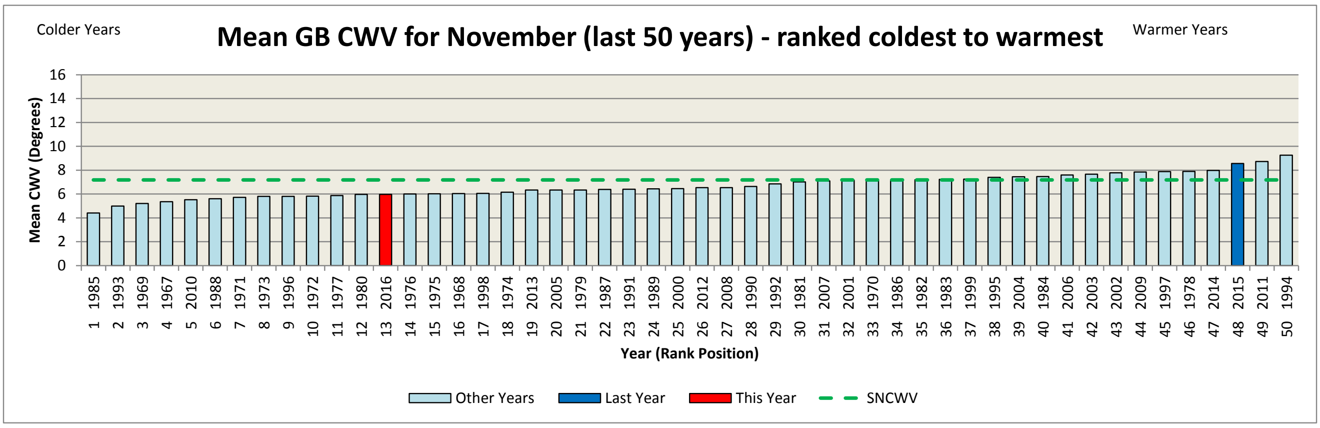
Overall, the first quarter (October'16 to December'16) of gas year 2016/17 was slightly colder than the current seasonal normal whereas the second quarter was generally warmer. The third quarter of gas year 2016/17 was generally warmer and the fourth quarter generally colder than the current seasonal normal.

Confidence interval analysis has been performed on the observed WCF values during Gas Year 2016/17. The confidence intervals were calculated for each month and LDZ based on five years of historic WCF data from Gas Years 2011/12, 2012/13, 2013/14, 2014/15 & 2015/16. The 95% confidence interval has been calculated by using the mean and standard deviation over the five years listed and these intervals can be used to identify when the WCF is regarded as unusual. Figures S12.37 to S12.48 are line charts showing the observed WCF during Gas Year 2016/17 for each LDZ, compared to the upper and lower confidence intervals. Figure S12.49 is a table showing the percentage of daily WCF values which fall within the confidence intervals for each LDZ and Month combination. In assessing this table, the months of November 2016 and February 2017 stand out, with the number of daily WCF values within the derived confidence intervals being less than 95% in 12 out of 13 LDZs and 11 out of 13 LDZs respectively. As previously stated, November 2016 was much colder than current seasonal normal overall, with most individual days also being colder than normal. In contrast, February 2017 was warmer than current seasonal normal overall with the majority of days throughout the month being much warmer than normal.

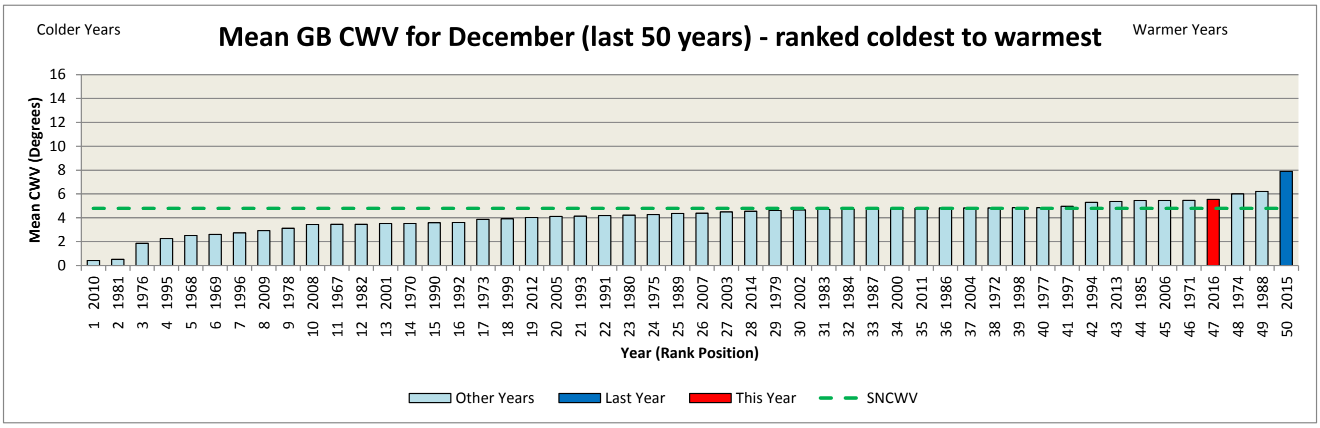
## Figure S12.1 – 50 Year GB CWV Ranking – October



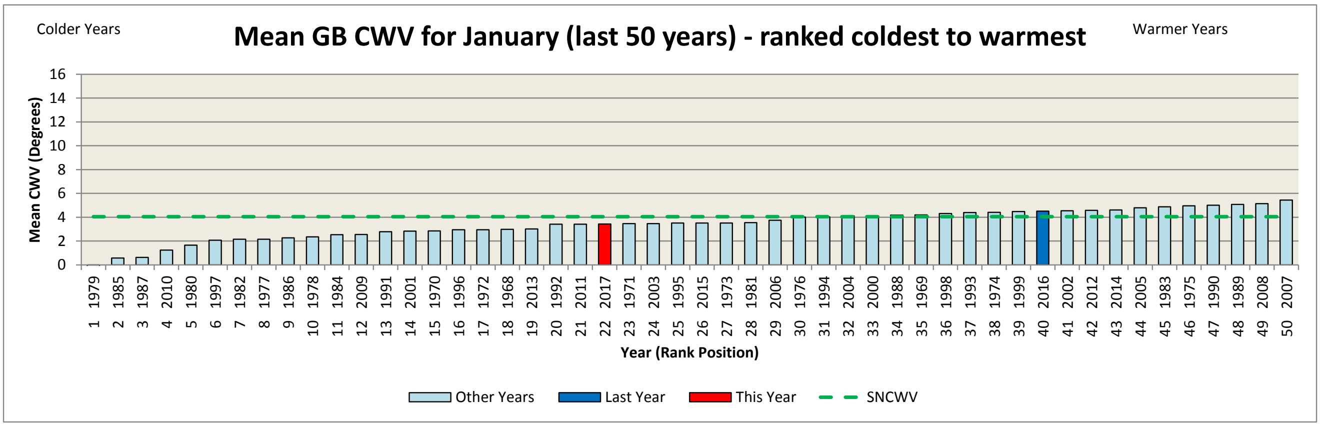

## Figure S12.2 – 50 Year GB CWV Ranking - November



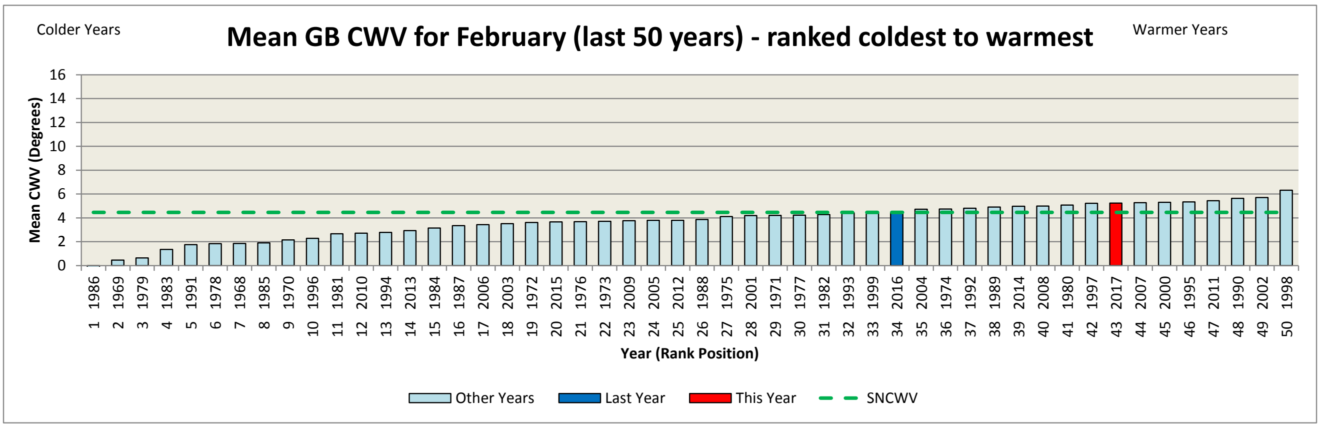

## Figure S12.3 – 50 Year GB CWV Ranking - December



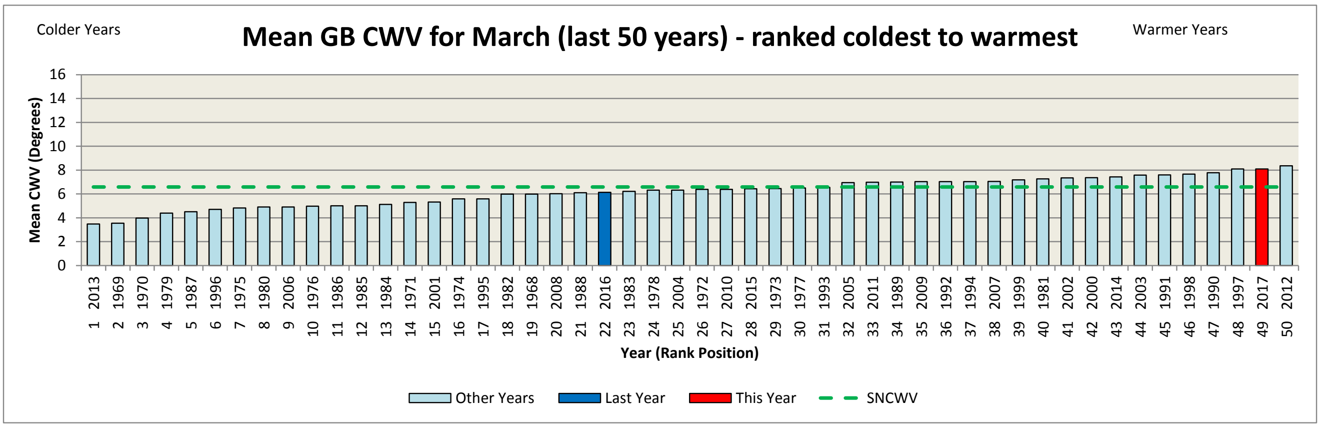
## Figure S12.4 – 50 Year GB CWV Ranking - January



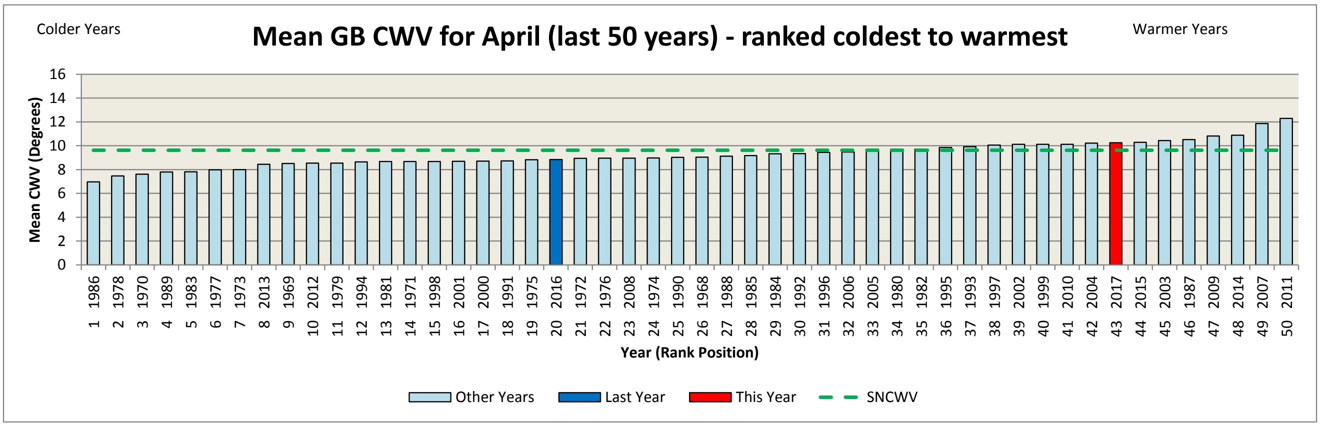

## Figure S12.5 – 50 Year GB CWV Ranking - February



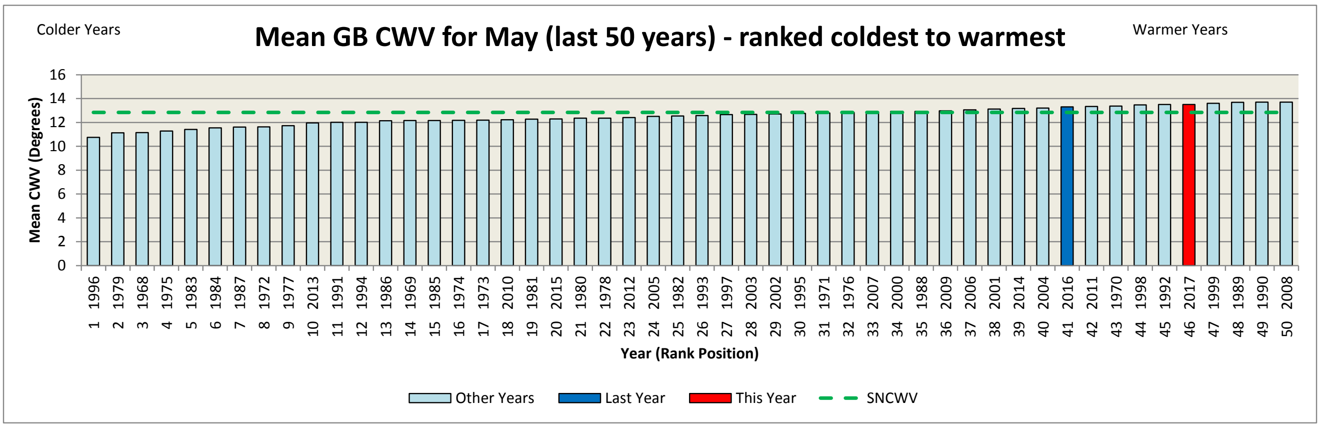

## Figure S12.6 – 50 Year GB CWV Ranking - March



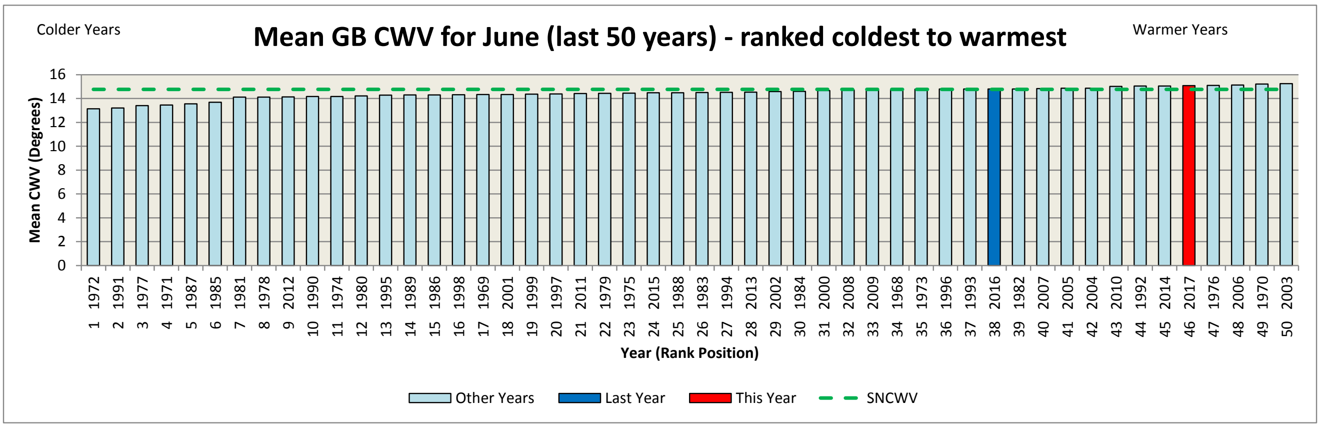
## Figure S12.7 – 50 Year GB CWV Ranking - April



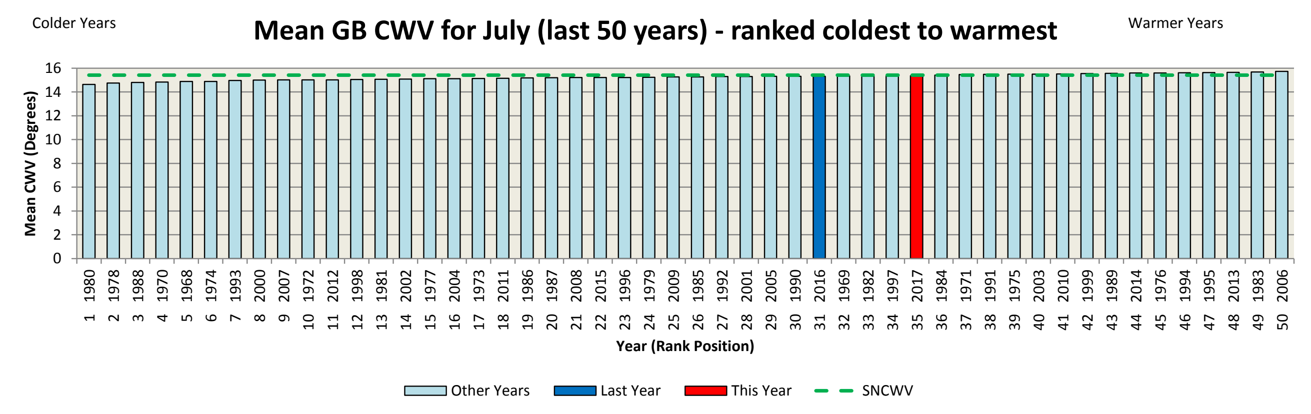

## Figure S12.8 – 50 Year GB CWV Ranking - May



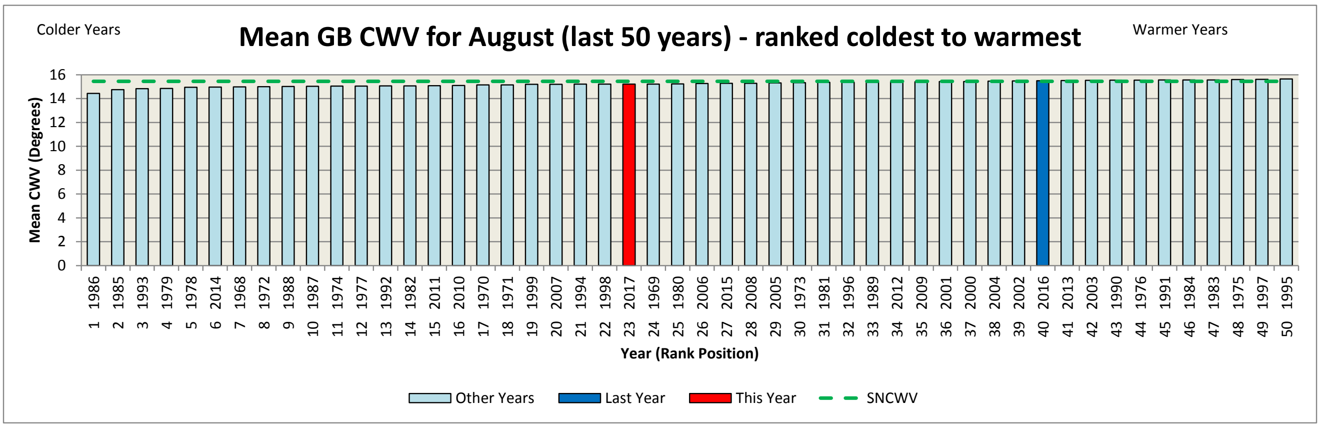

## Figure S12.9 – 50 Year GB CWV Ranking - June



## Figure S12.10 – 50 Year GB CWV Ranking - July




## Figure S12.11 – 50 Year GB CWV Ranking - August




## Figure S12.12 – 50 Year GB CWV Ranking - September

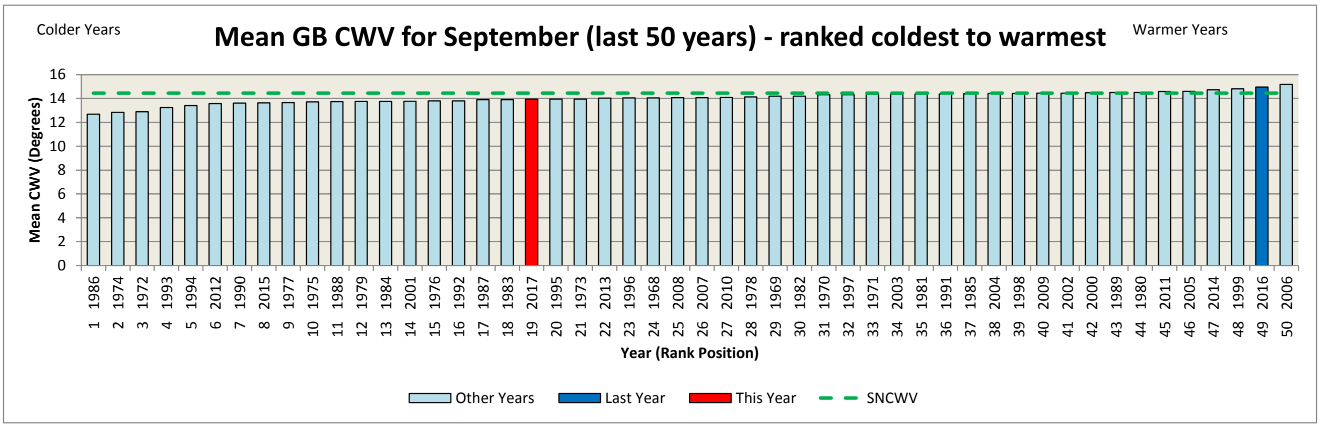


**Figure S12.13 – Daily Comparisons of CWV vs SNCWV (GB) - October**

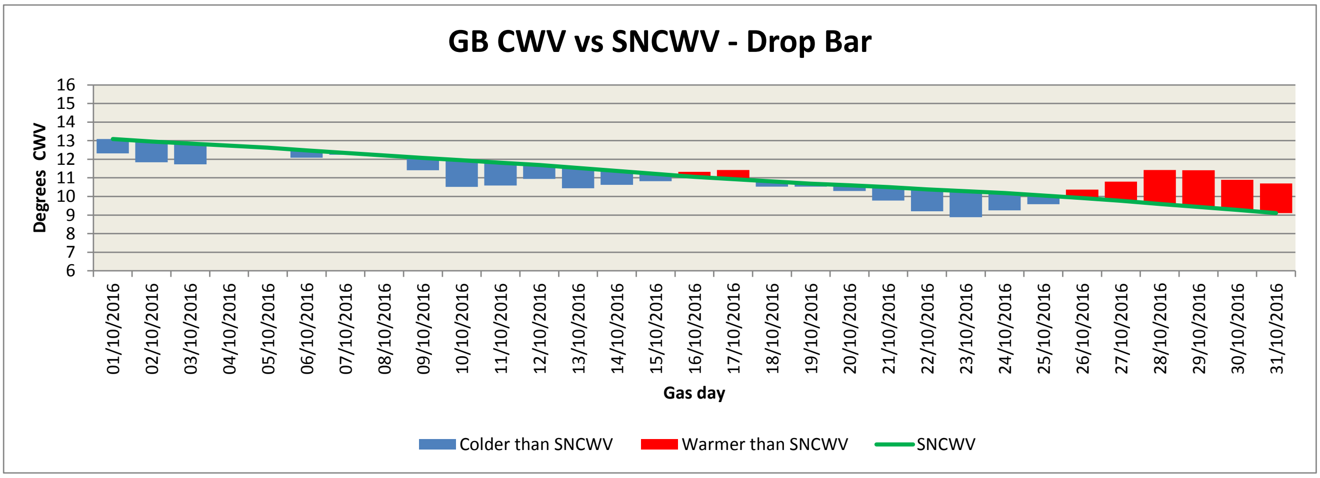



**Figure S12.14 – Daily Comparisons of CWV vs SNCWV (GB) - November**

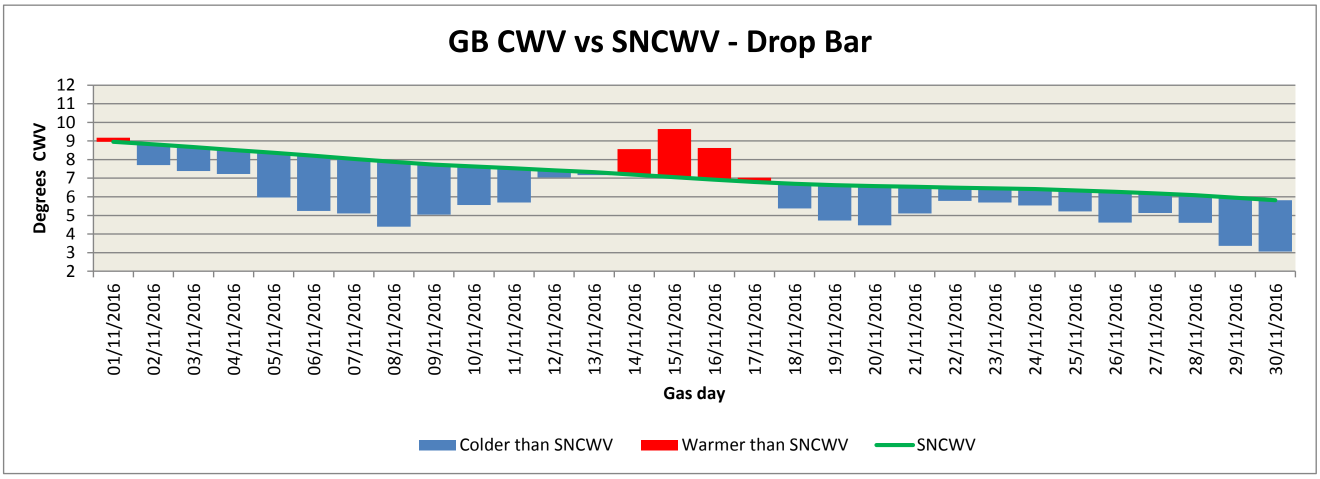



**Figure S12.15 – Daily Comparisons of CWV vs SNCWV (GB) - December**

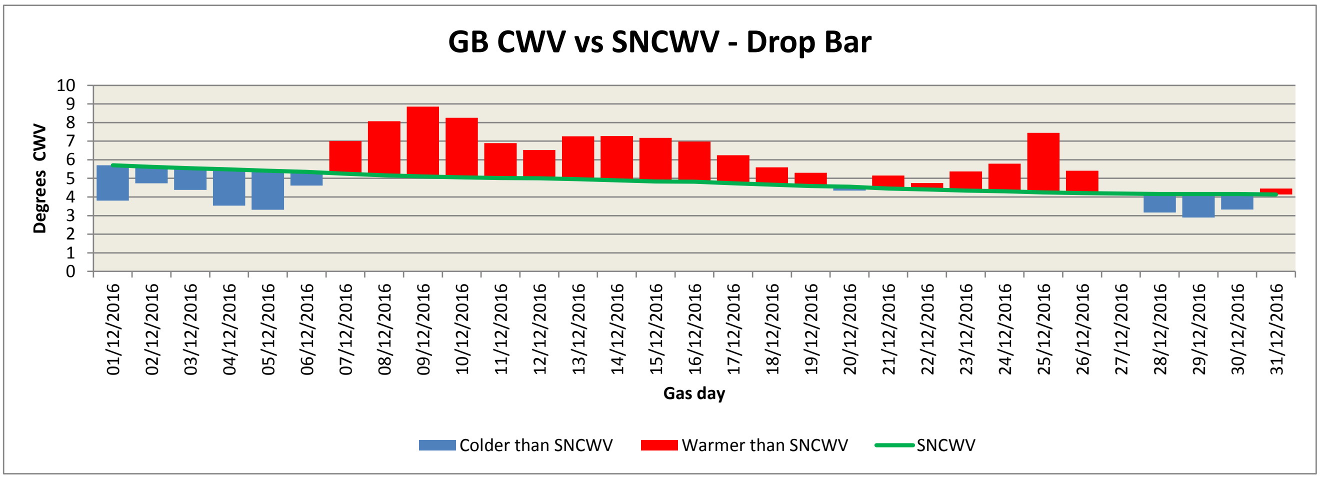


**Figure S12.16 – Daily Comparisons of CWV vs SNCWV (GB) - January**

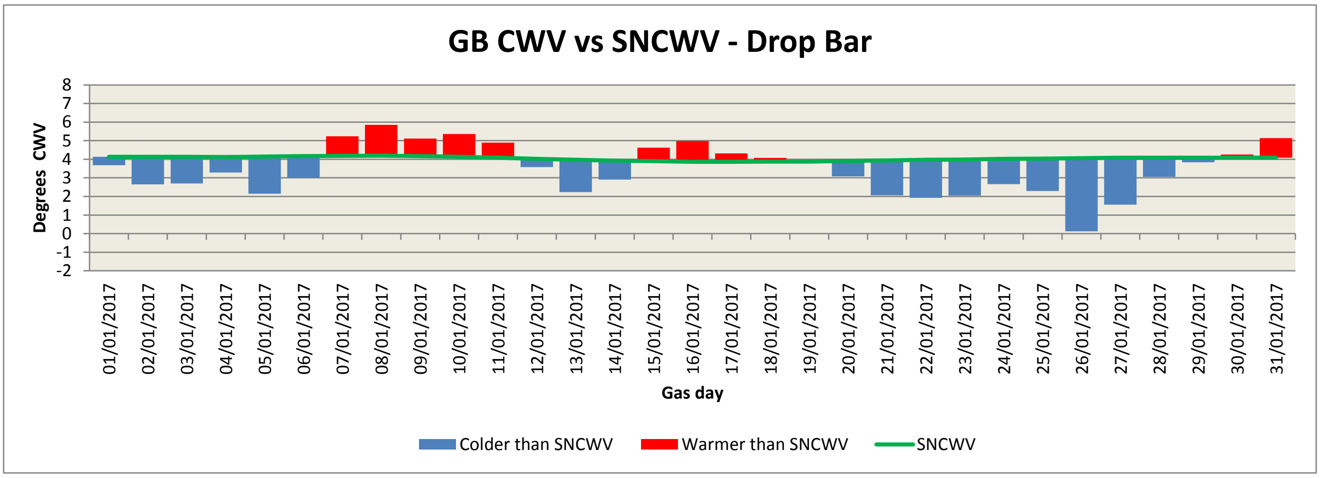



**Figure S12.17 – Daily Comparisons of CWV vs SNCWV (GB) - February**

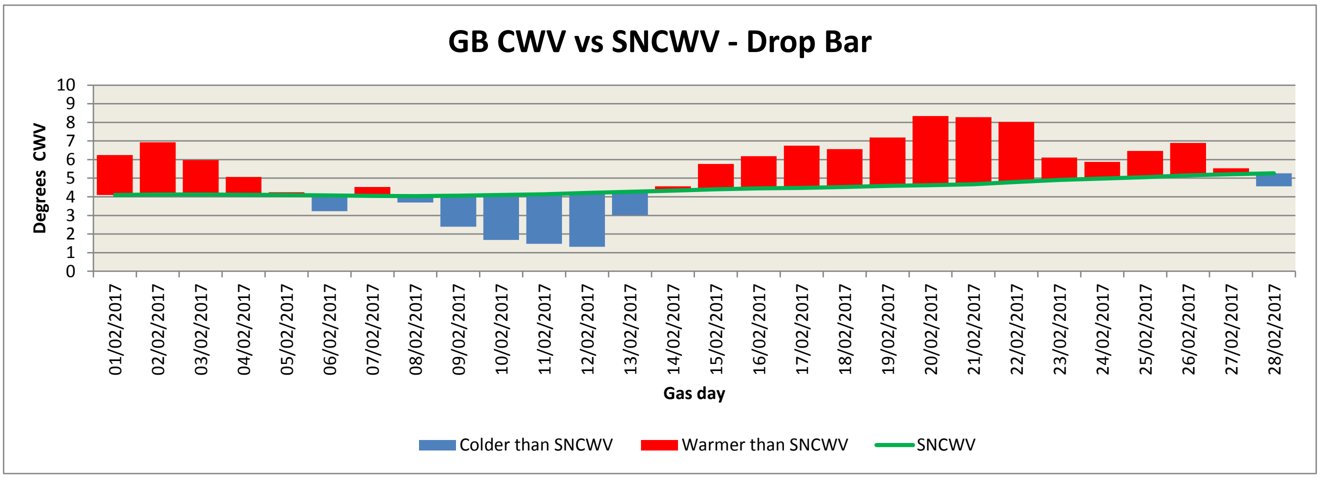



**Figure S12.18 – Daily Comparisons of CWV vs SNCWV (GB) - March**

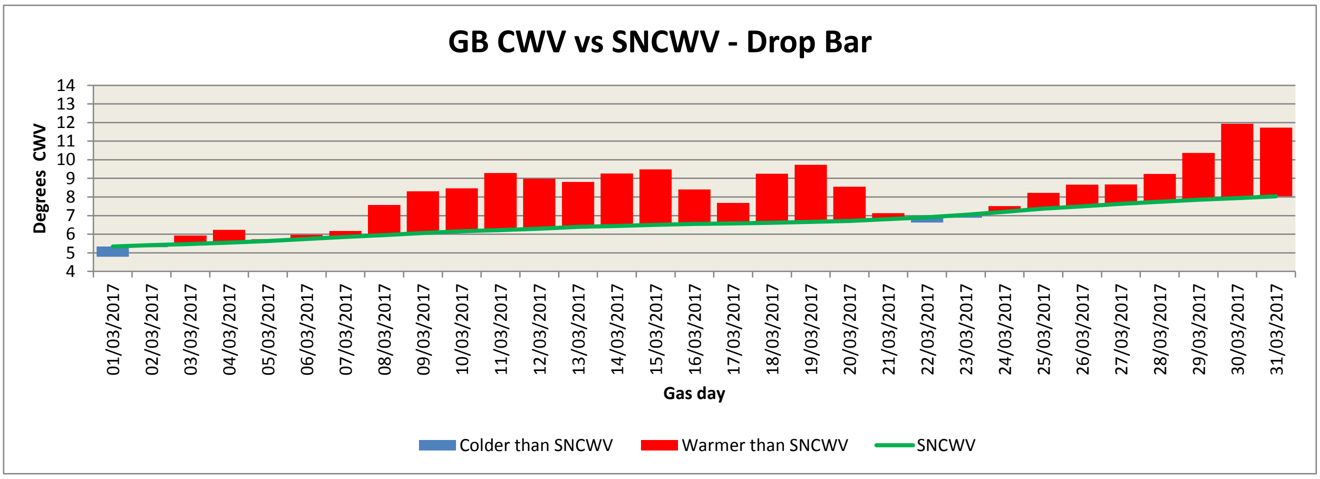


**Figure S12.19 – Daily Comparisons of CWV vs SNCWV (GB) - April**

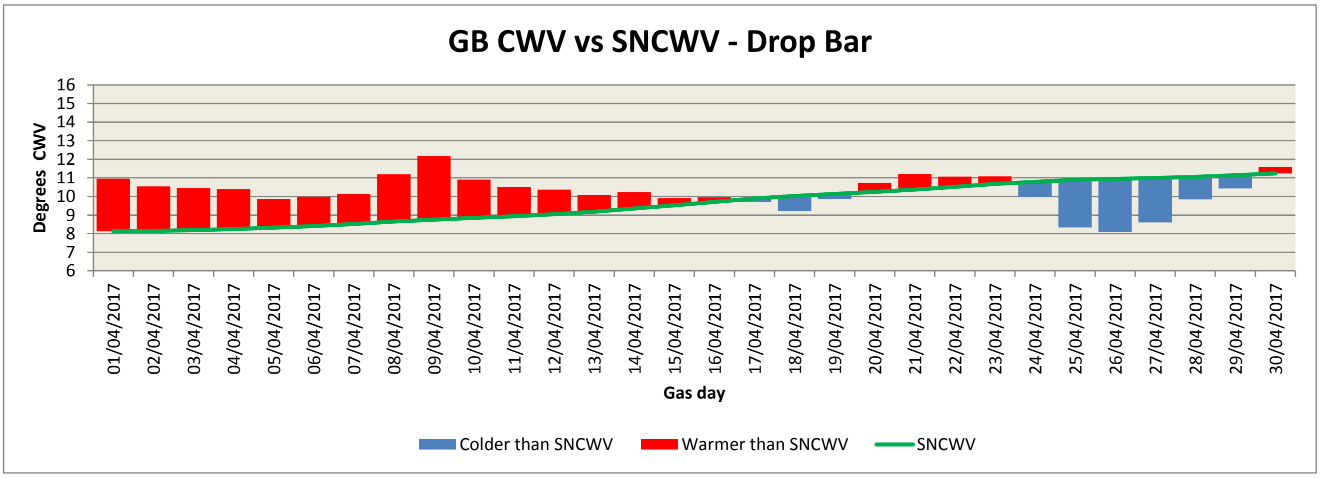



**Figure S12.20 – Daily Comparisons of CWV vs SNCWV (GB) - May**

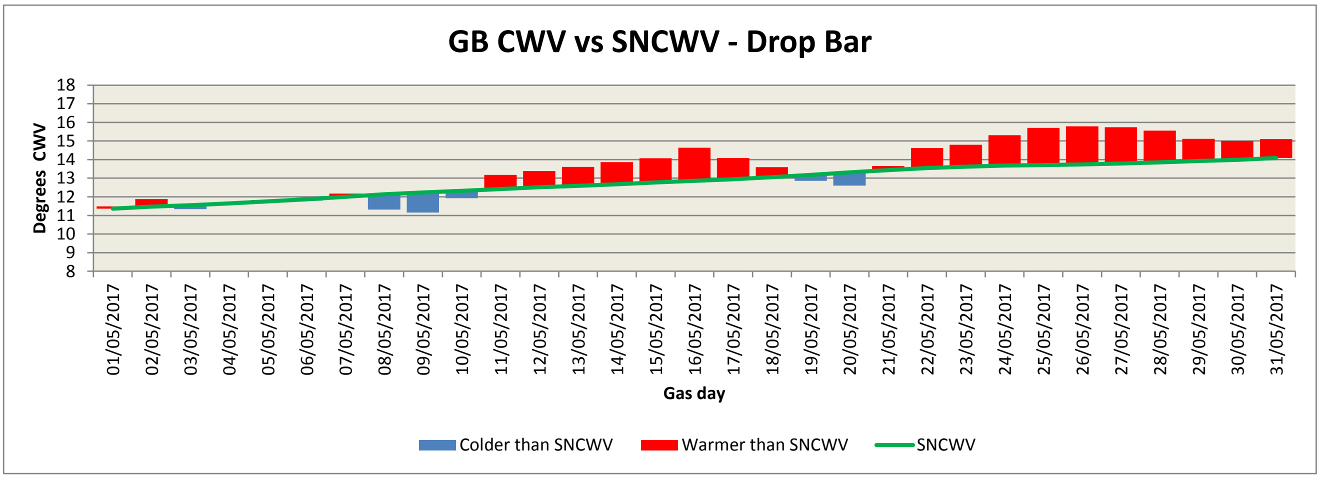
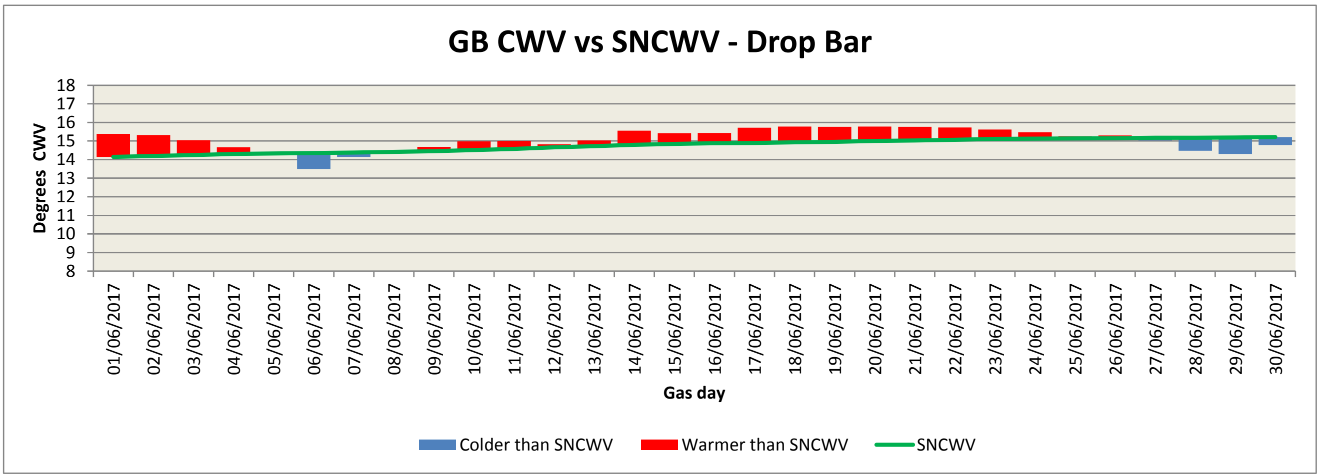
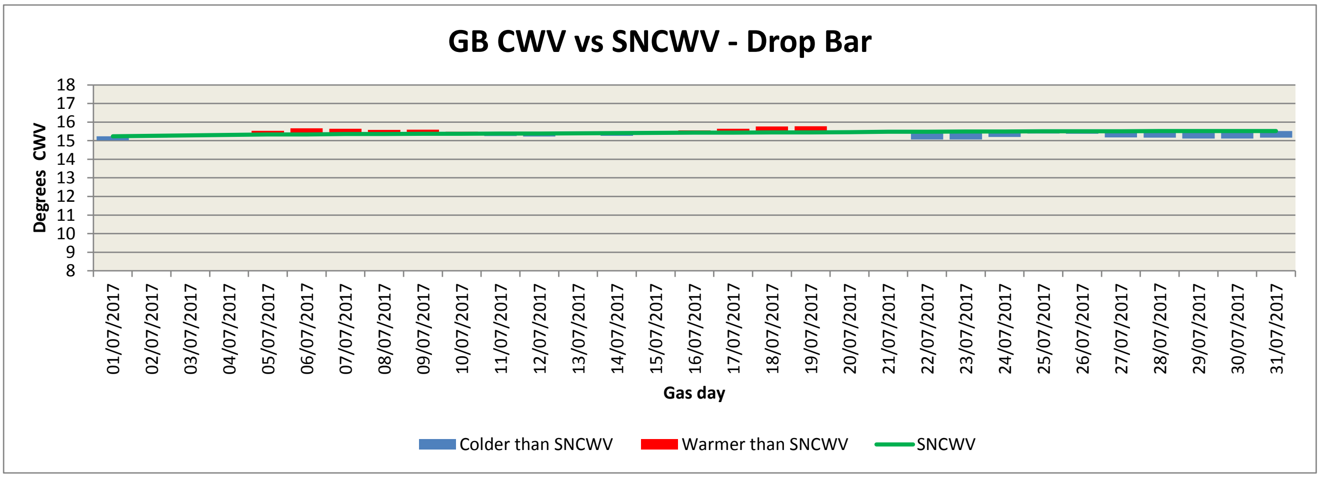


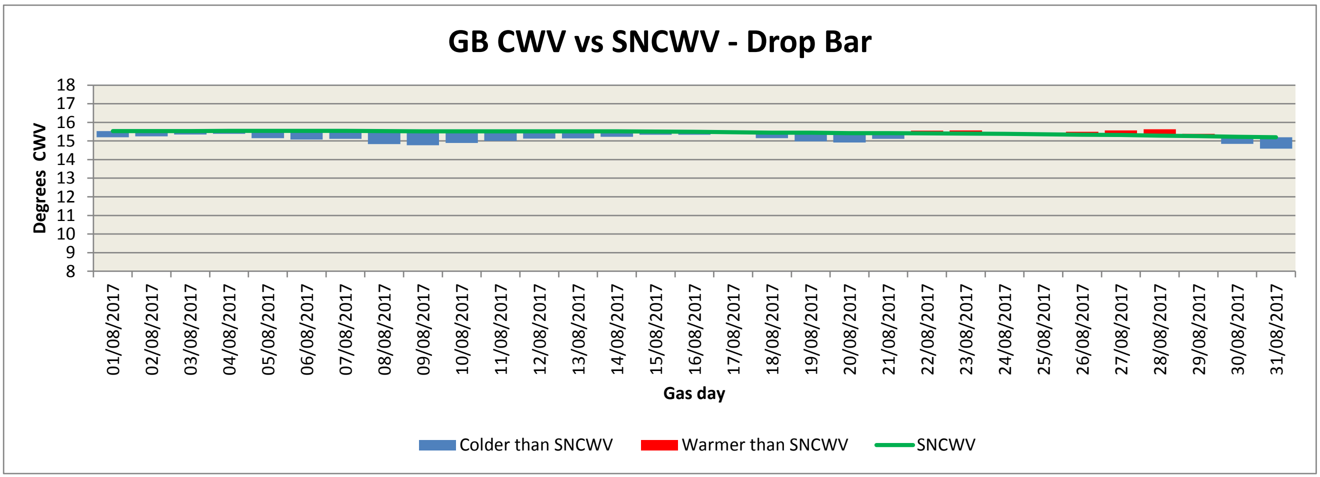

**Figure S12.21 – Daily Comparisons of CWV vs SNCWV (GB) - June**



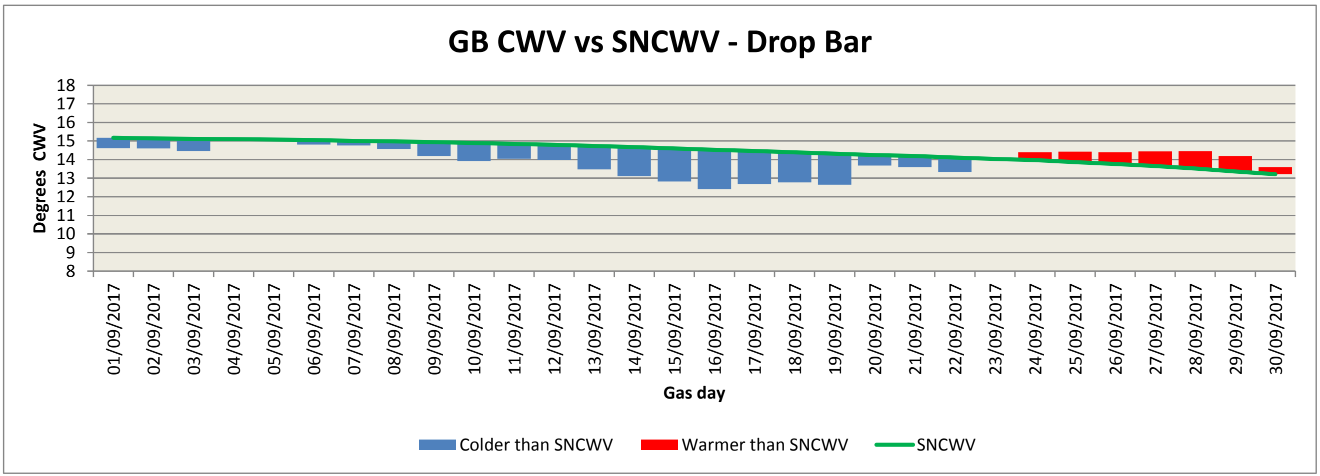
## Figure S12.22 – Daily Comparisons of CWV vs SNCWV (GB) - July



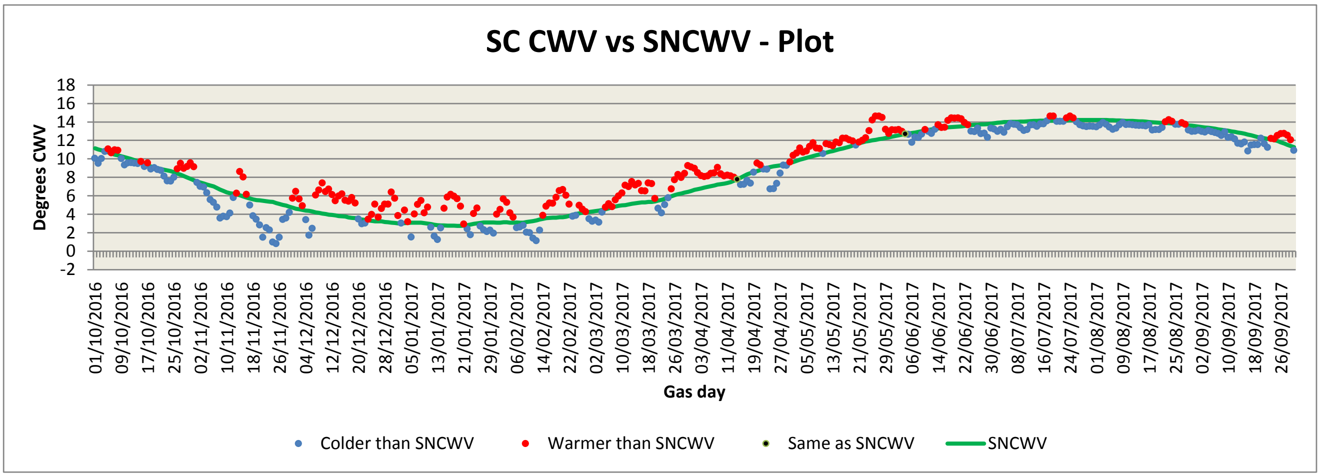

## Figure S12.23 – Daily Comparisons of CWV vs SNCWV (GB) - August



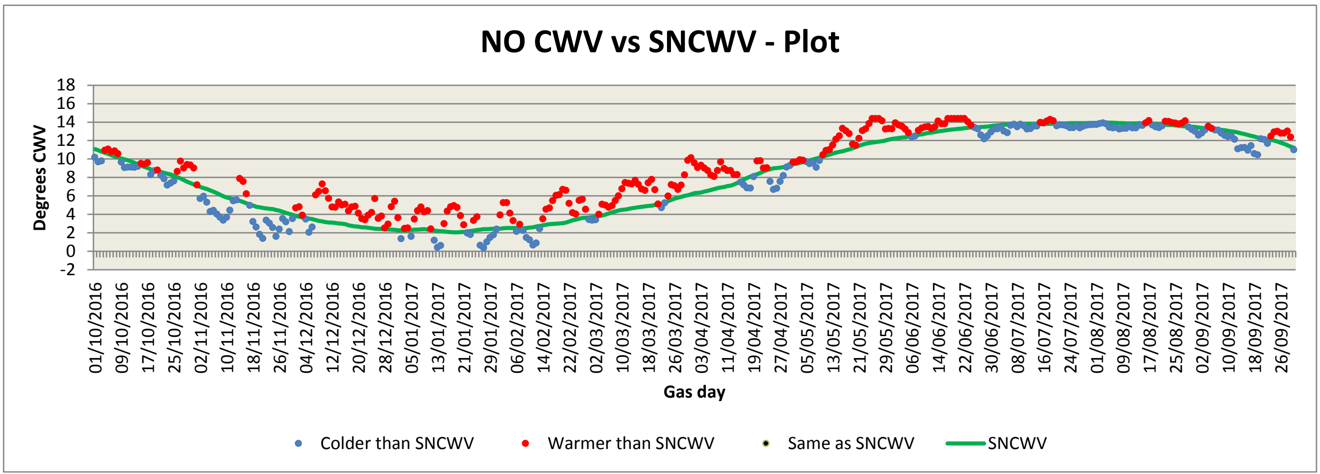

## Figure S12.24 – Daily Comparisons of CWV vs SNCWV (GB) - September



## Figure S12.25 – Daily Comparisons of CWV vs SNCWV (LDZ SC) - Full Year




## Figure S12.26 – Daily Comparisons of CWV vs SNCWV (LDZ NO) - Full Year




## Figure S12.27 – Daily Comparisons of CWV vs SNCWV (LDZ NW & WN) - Full Year

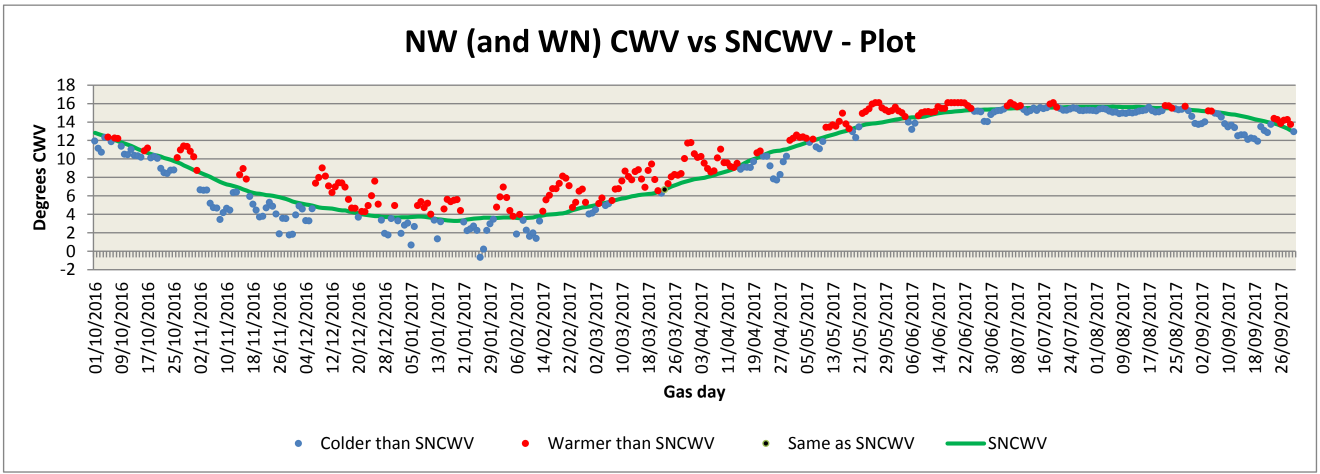


**Figure S12.28 – Daily Comparisons of CWV vs SNCWV (LDZ NE) - Full Year**

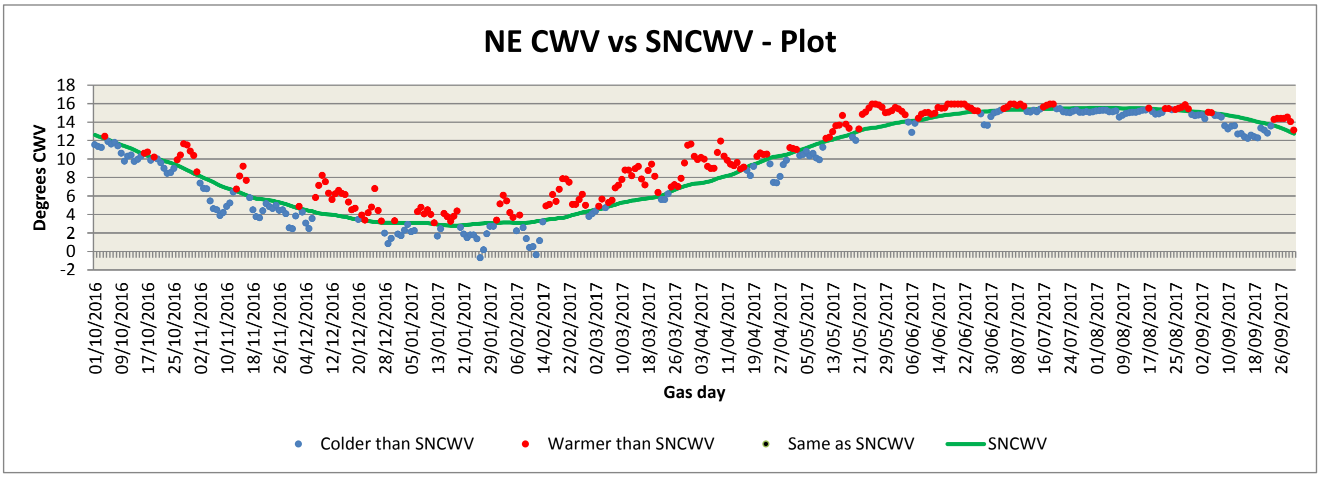



**Figure S12.29 – Daily Comparisons of CWV vs SNCWV (LDZ EM) - Full Year**

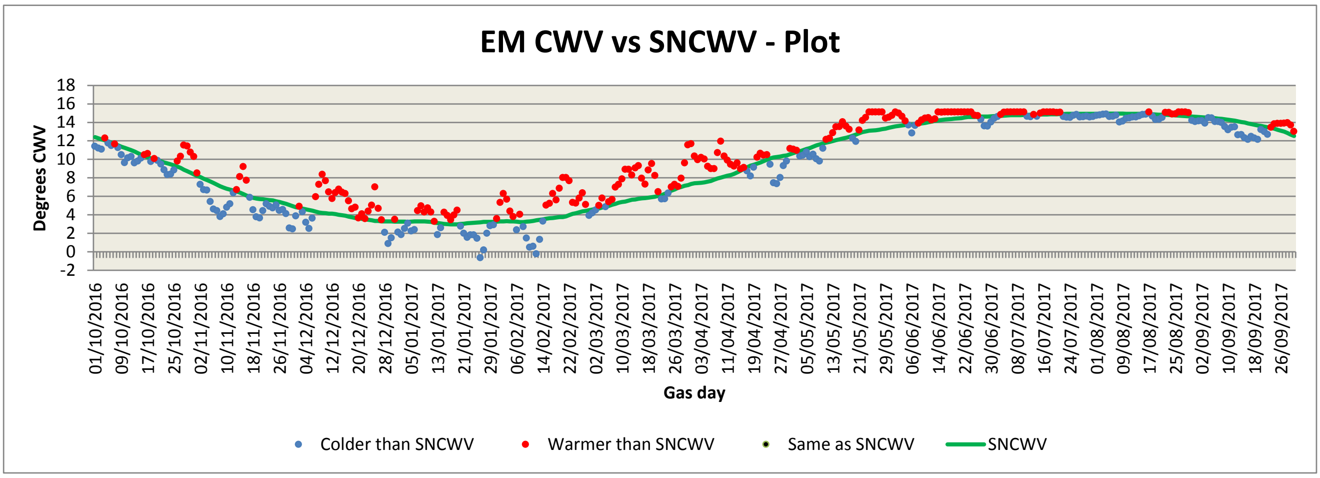



**Figure S12.30 – Daily Comparisons of CWV vs SNCWV (LDZ WM) - Full Year**

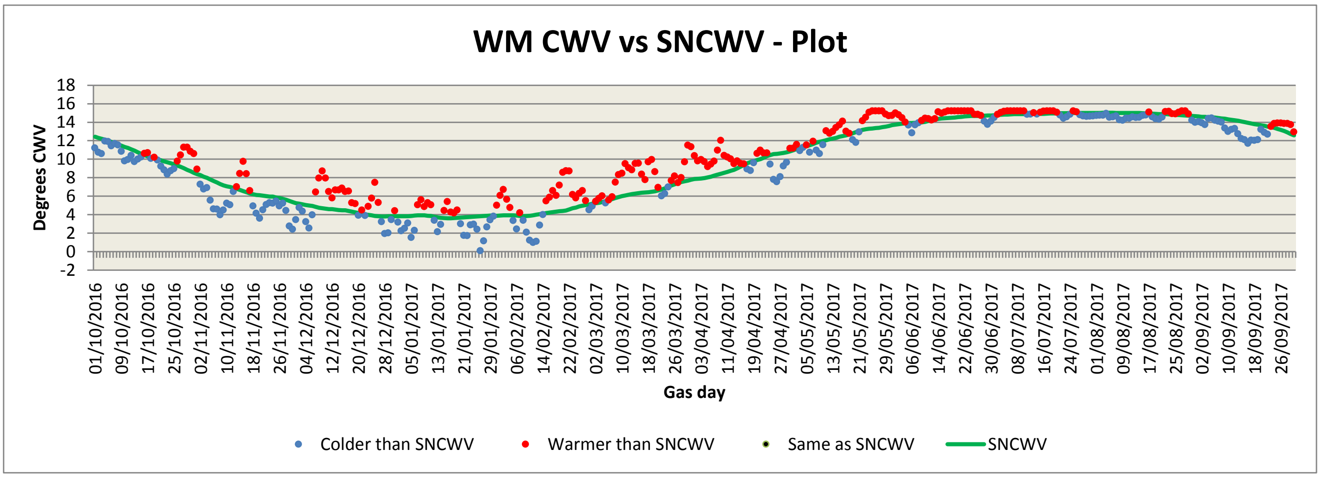


**Figure S12.31 – Daily Comparisons of CWV vs SNCWV (LDZ WS) - Full Year**

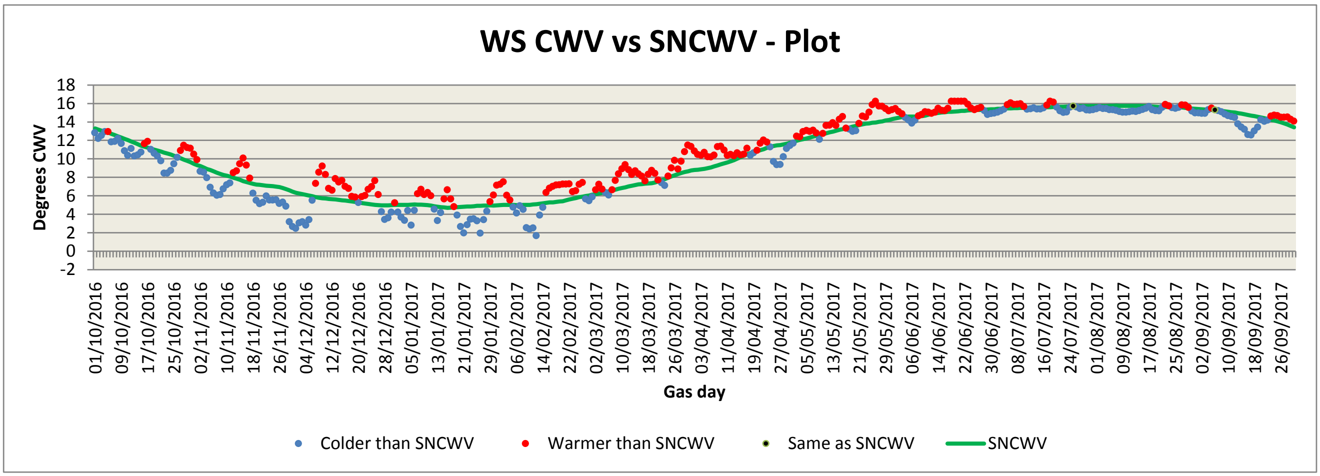



**Figure S12.32 – Daily Comparisons of CWV vs SNCWV (LDZ EA) - Full Year**

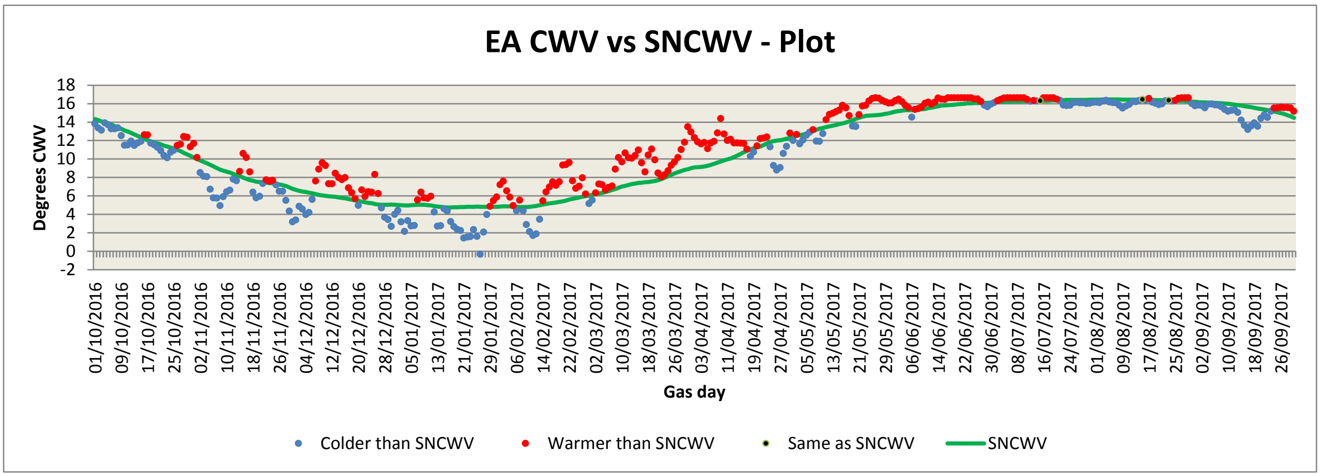
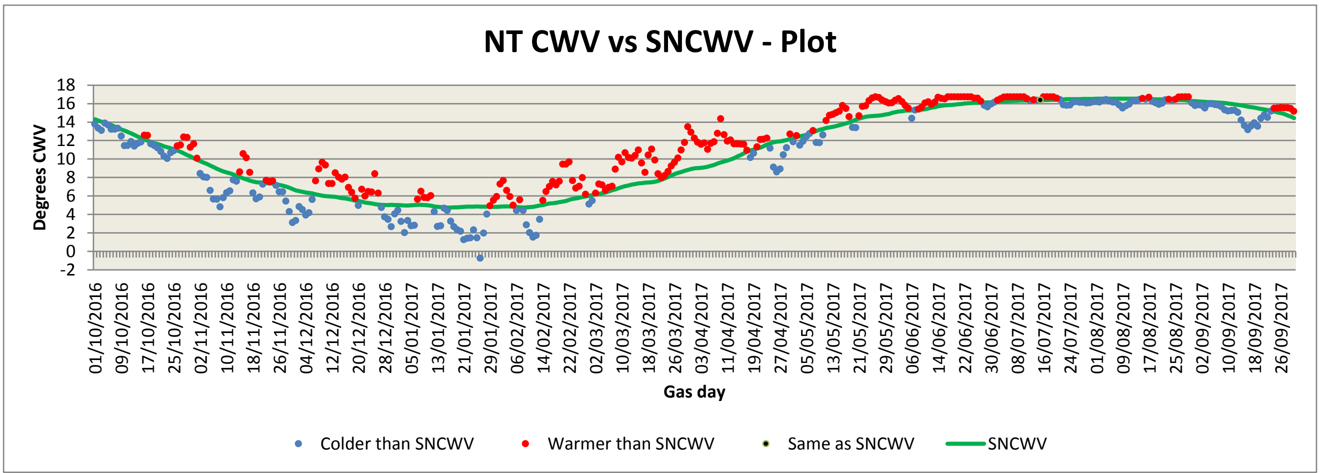
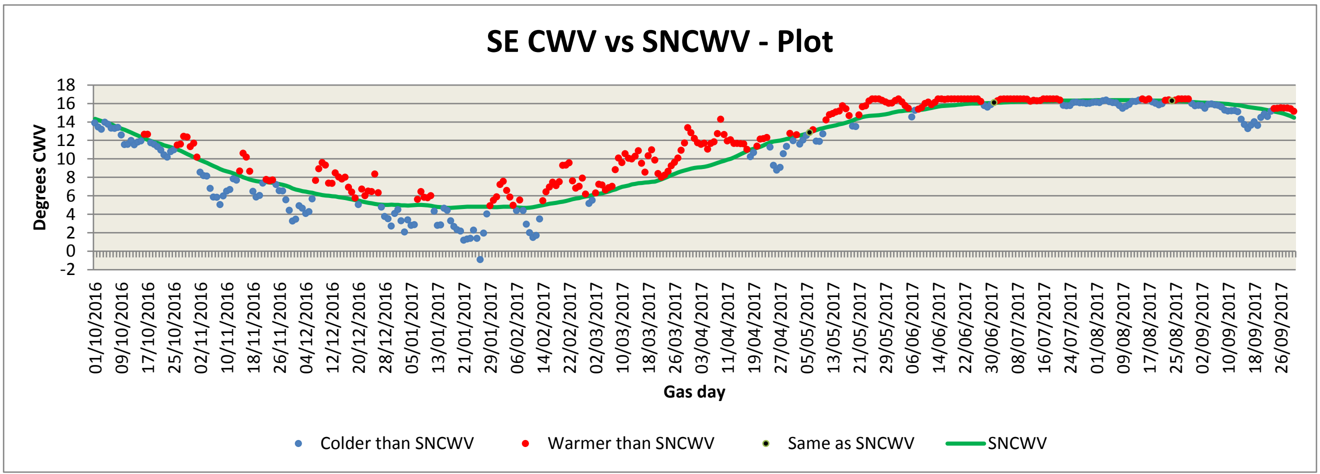


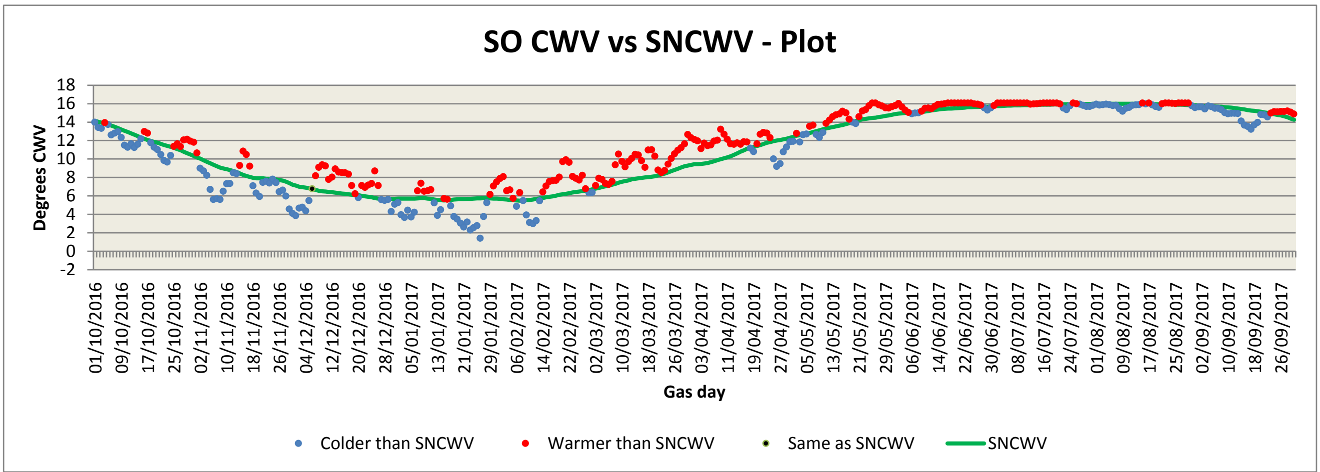

**Figure S12.33 – Daily Comparisons of CWV vs SNCWV (LDZ NT) - Full Year**



## Figure S12.34 – Daily Comparisons of CWV vs SNCWV (LDZ SE) - Full Year




## Figure S12.35 – Daily Comparisons of CWV vs SNCWV (LDZ SO) - Full Year




## Figure S12.36 – Daily Comparisons of CWV vs SNCWV (LDZ SW) - Full Year

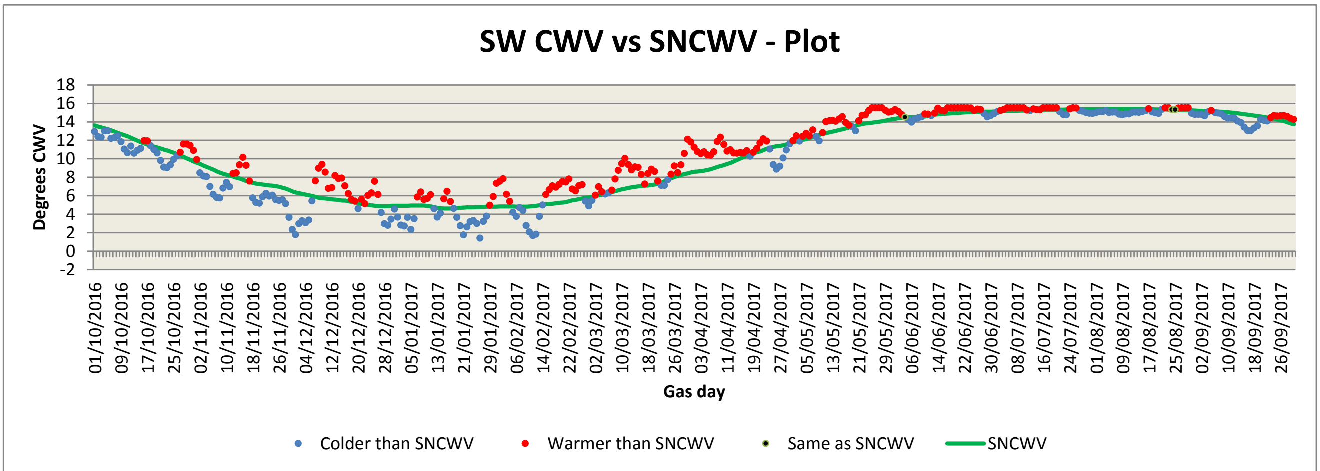


**Figure S12.37 – WCF vs Confidence Intervals (LDZ SC) - Full Year**

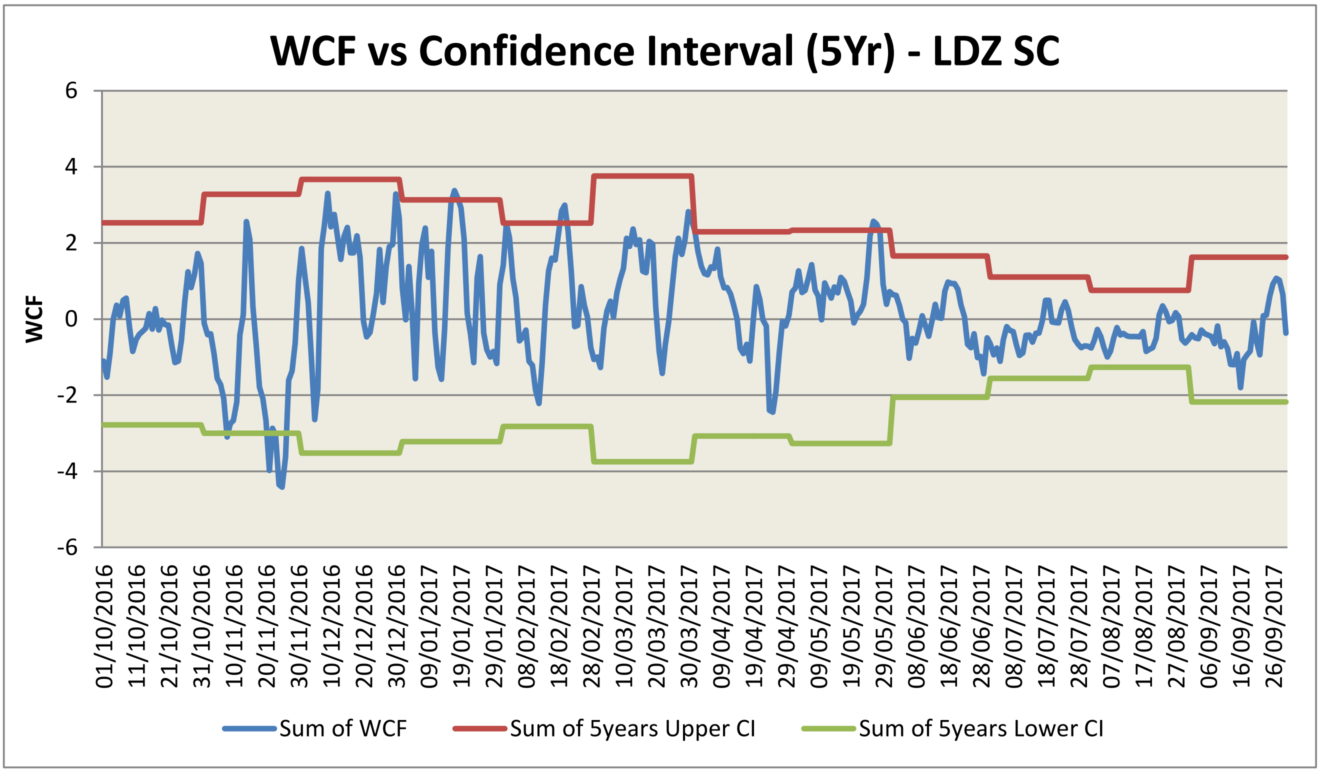



**Figure S12.38 – WCF vs Confidence Intervals (LDZ NO) - Full Year**

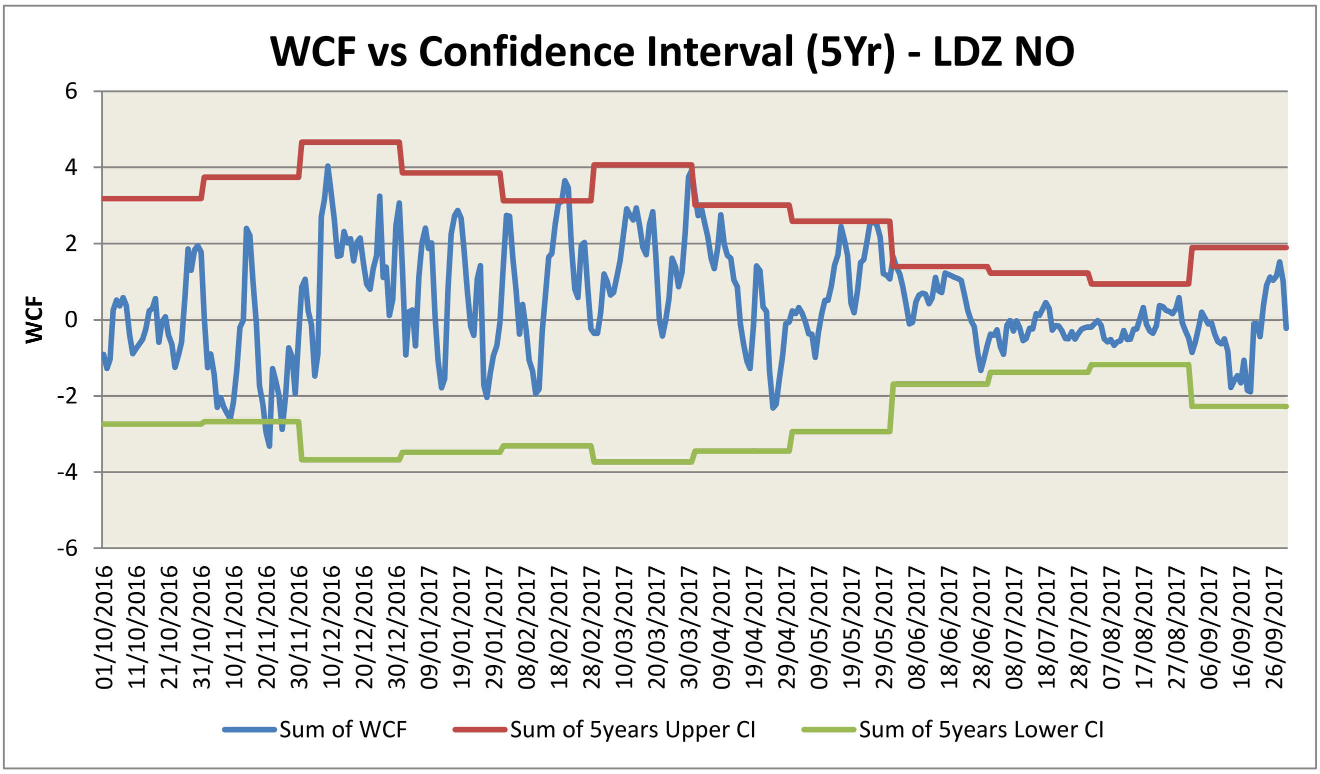


**Figure S12.39 – WCF vs Confidence Intervals (LDZ NW and WN) - Full Year**

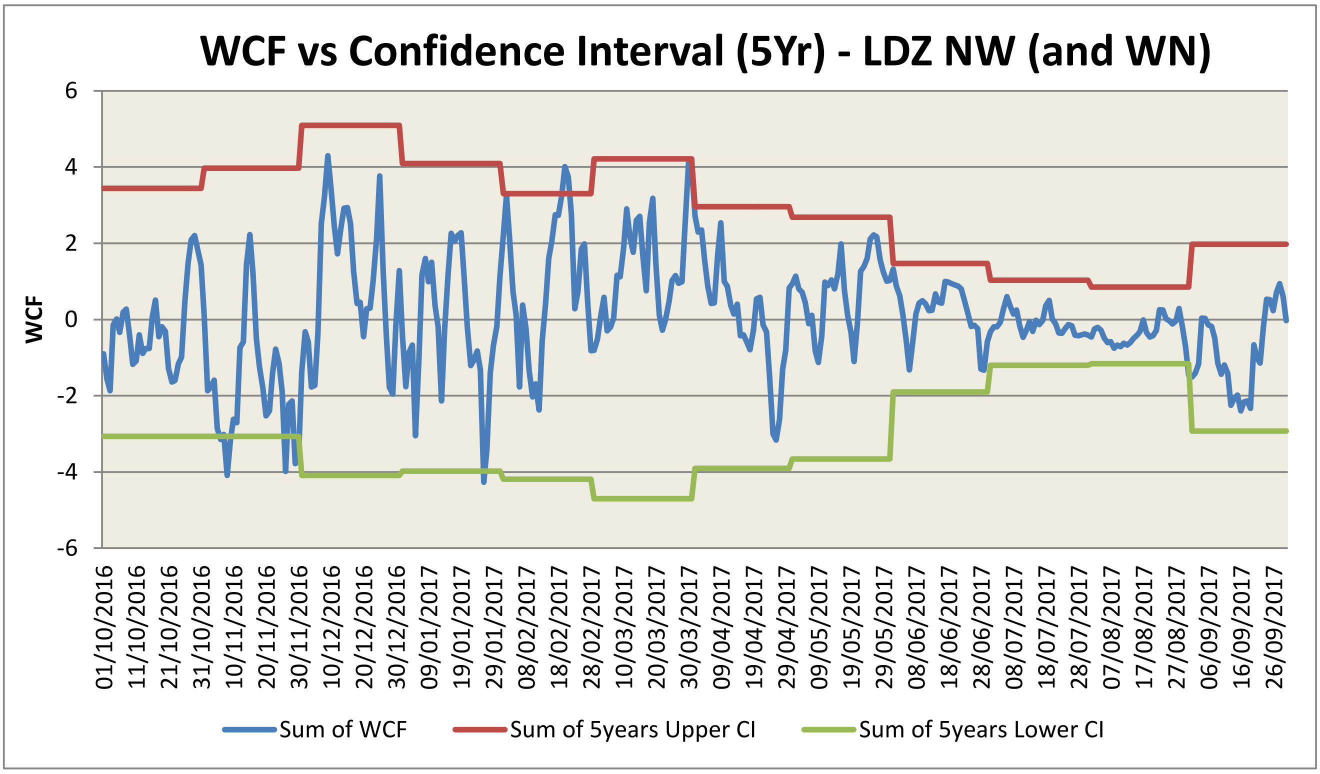



**Figure S12.40 – WCF vs Confidence Intervals (LDZ NE) - Full Year**

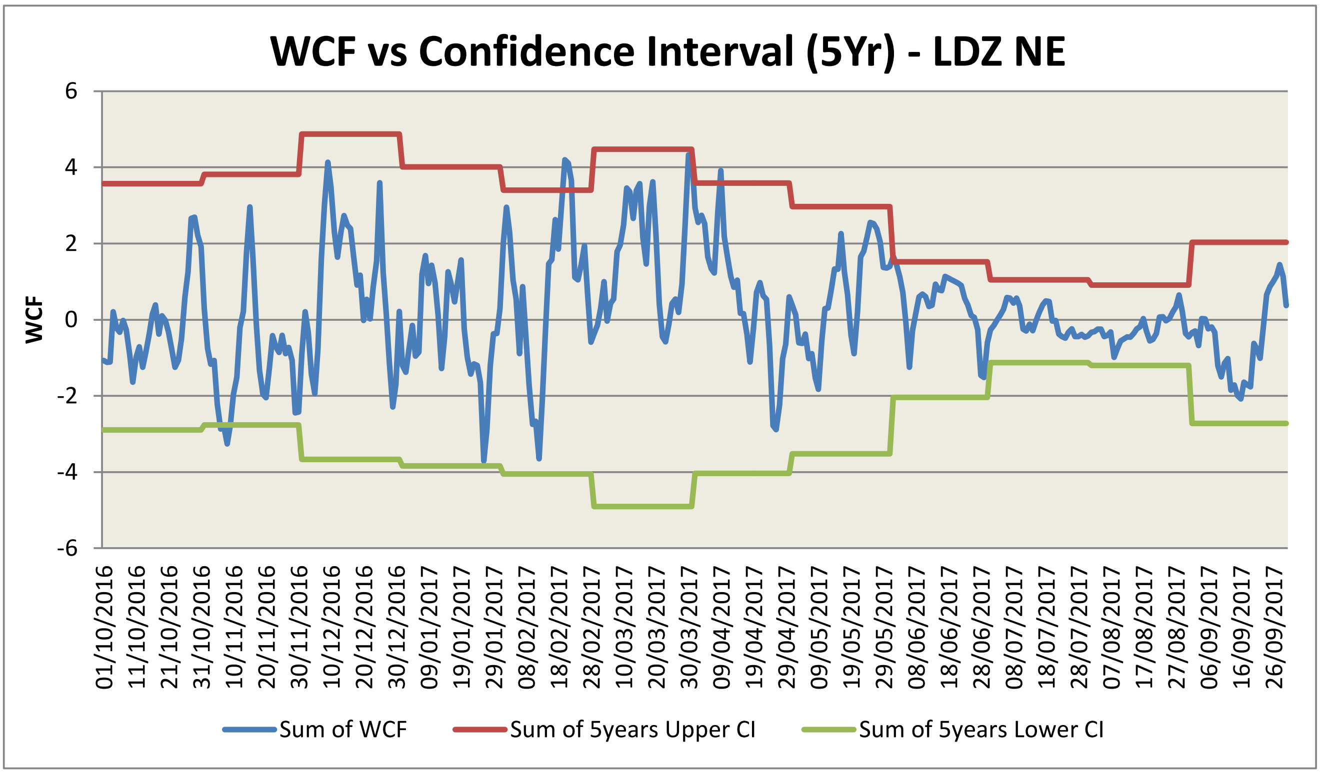


**Figure S12.41 – WCF vs Confidence Intervals (LDZ EM) - Full Year**

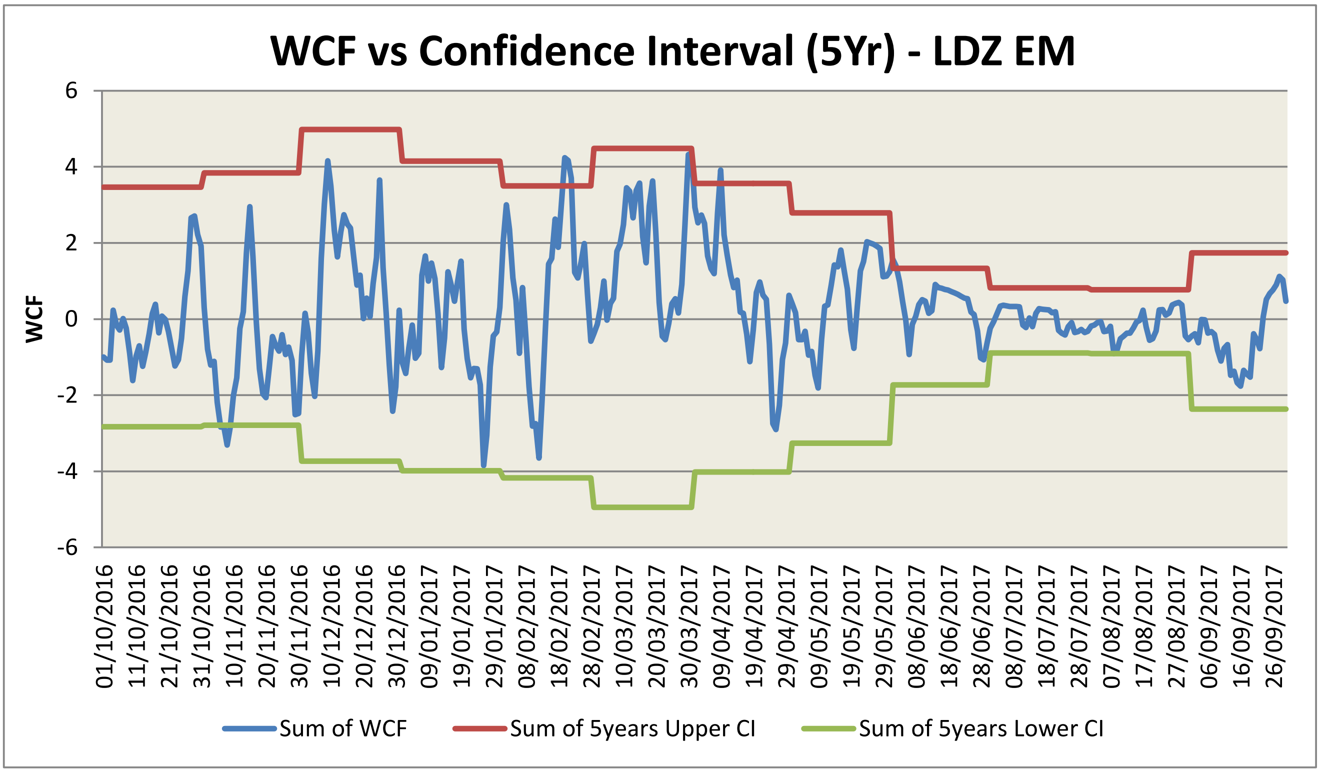



**Figure S12.42 – WCF vs Confidence Intervals (LDZ WM) - Full Year**

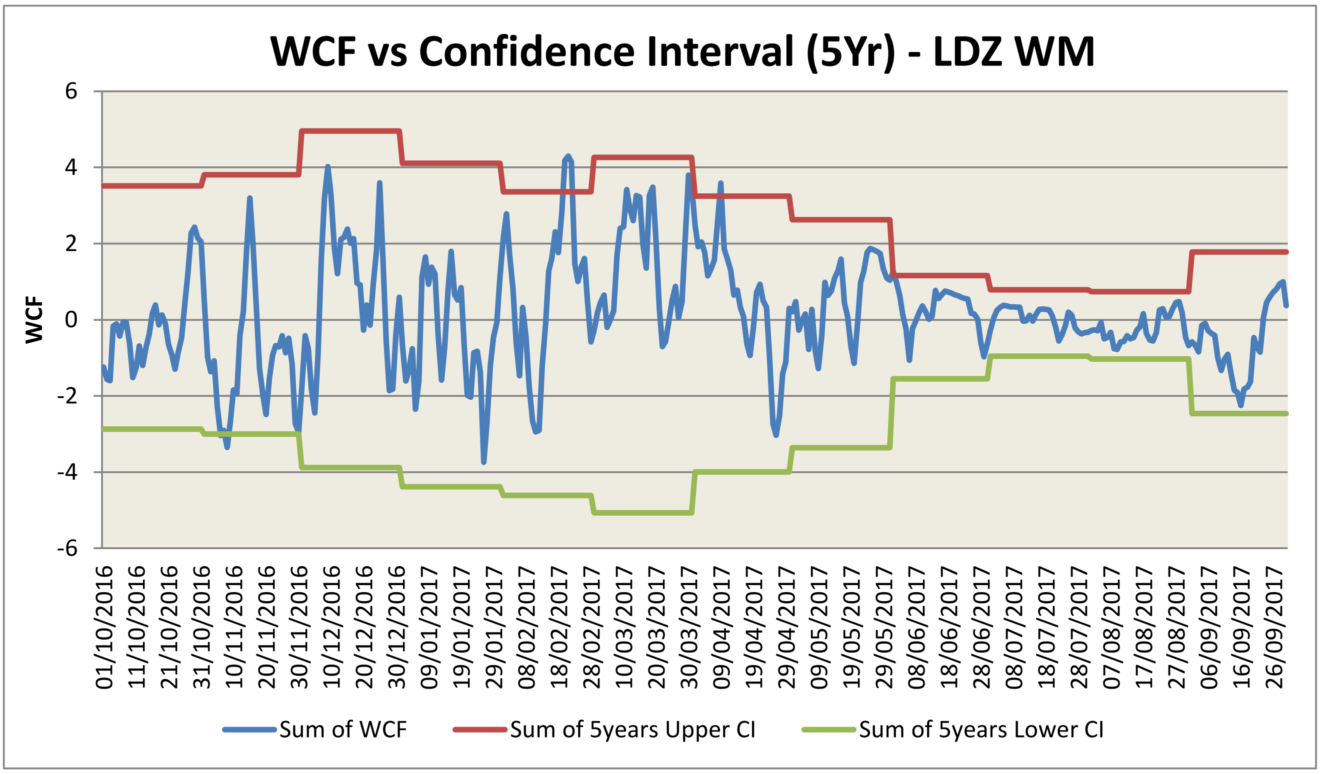


**Figure S12.43 – WCF vs Confidence Intervals (LDZ WS) - Full Year**

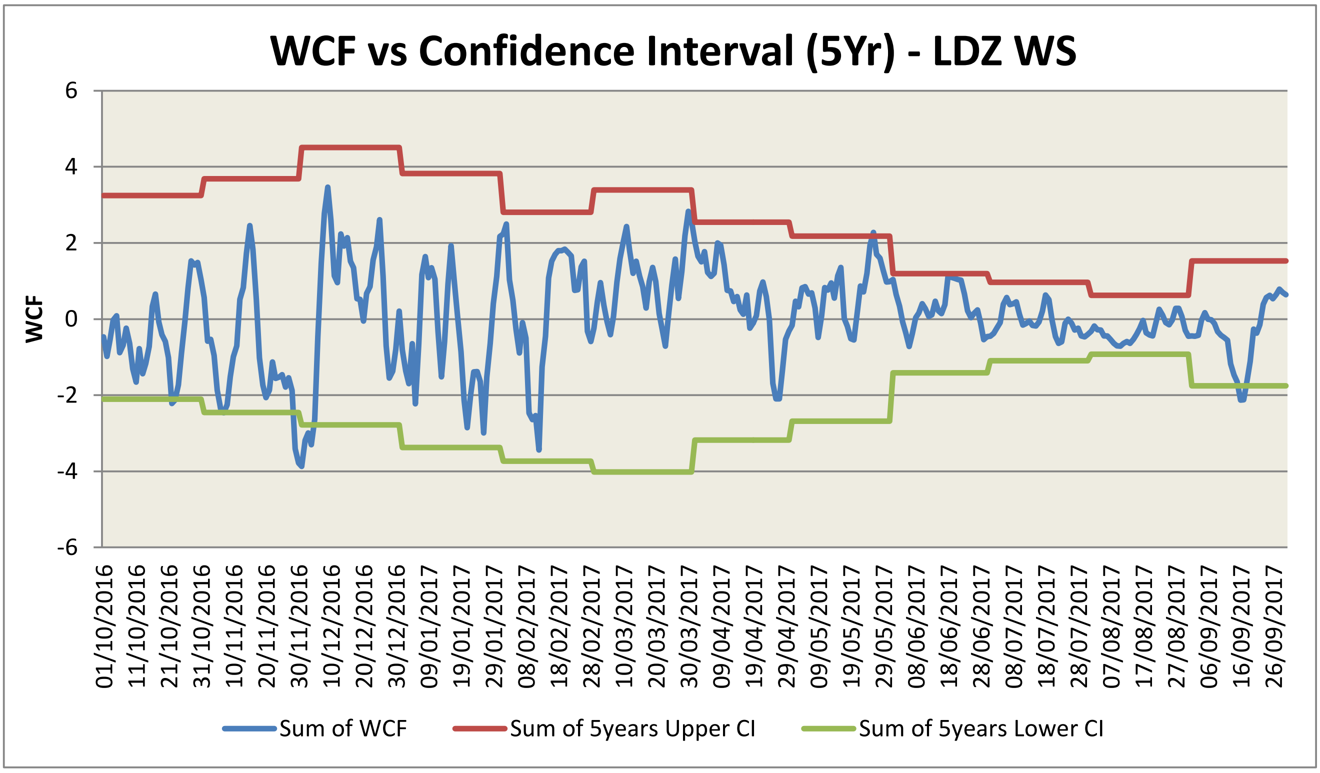



**Figure S12.44 – WCF vs Confidence Intervals (LDZ EA) - Full Year**

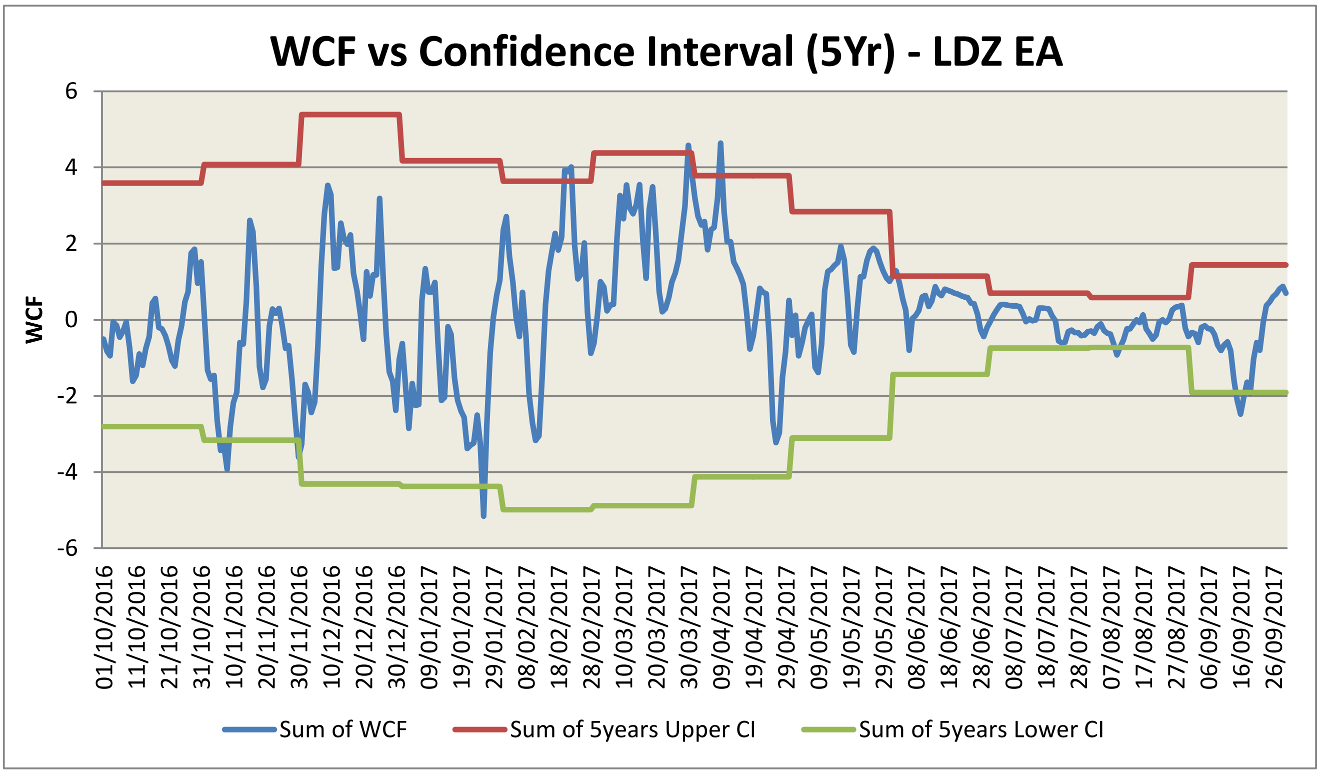


**Figure S12.45 – WCF vs Confidence Intervals (LDZ NT) - Full Year**

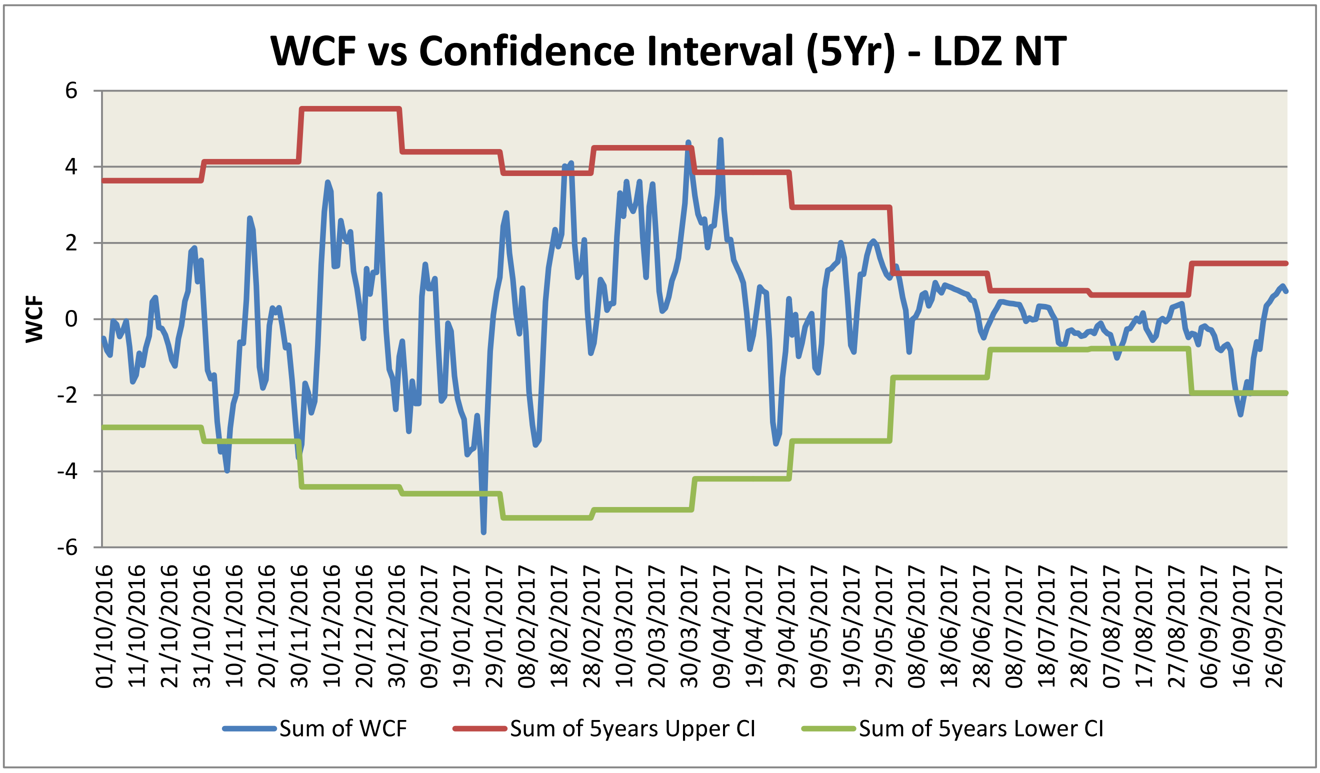



**Figure S12.46 – WCF vs Confidence Intervals (LDZ SE) - Full Year**

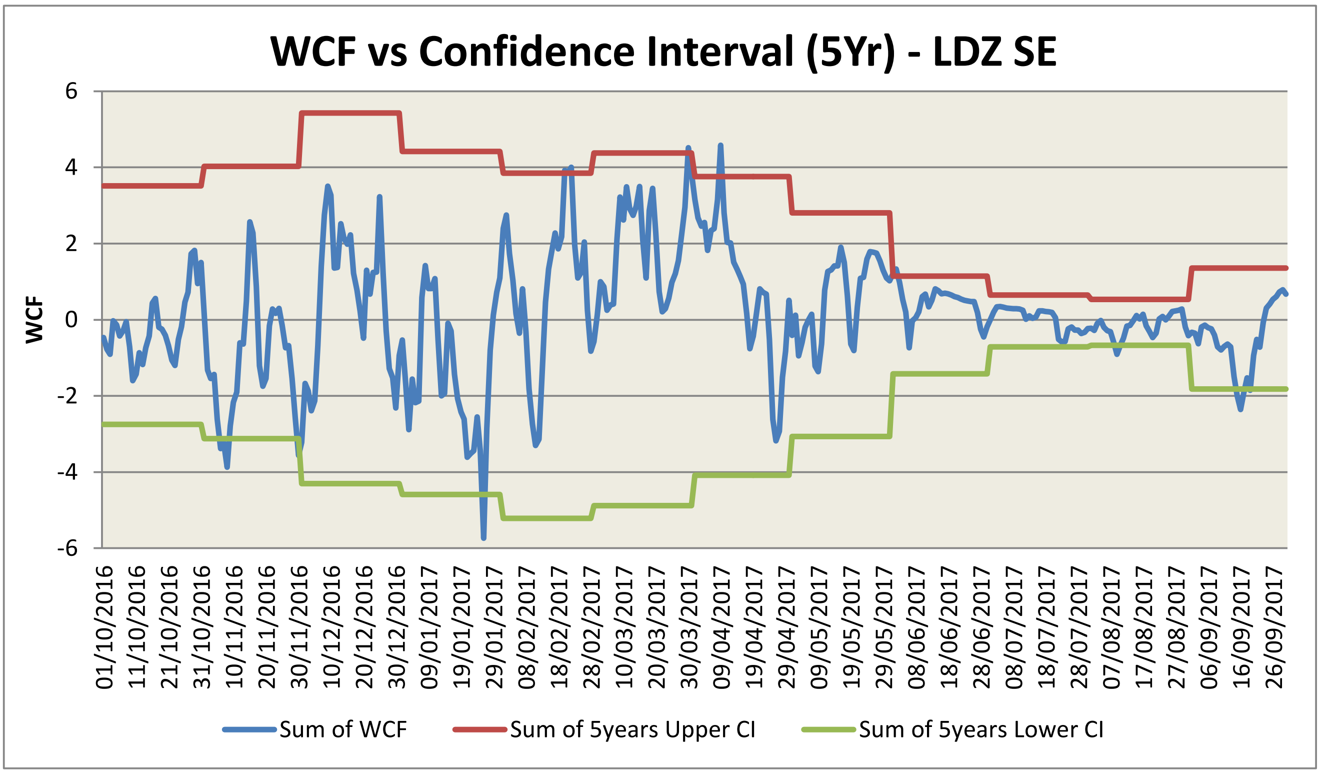


**Figure S12.47 – WCF vs Confidence Intervals (LDZ SO) - Full Year**

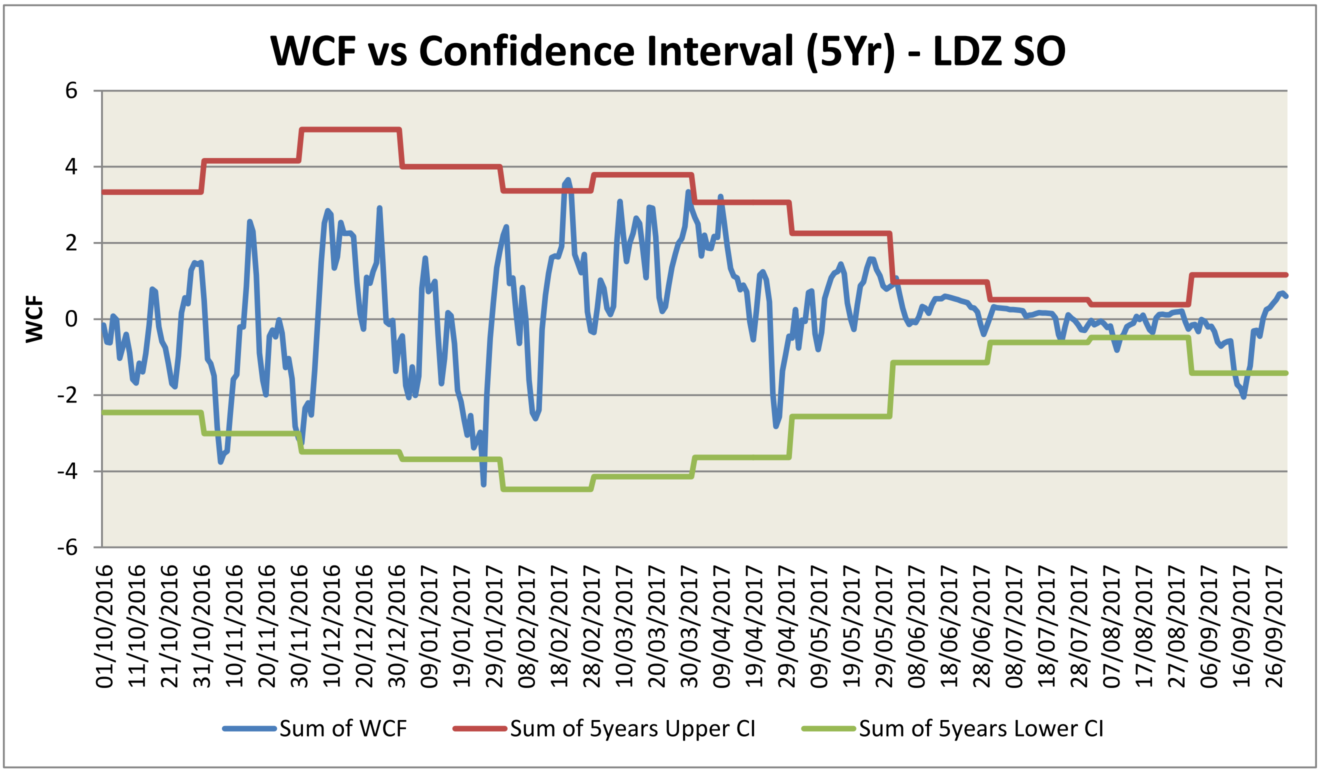



**Figure S12.48 – WCF vs Confidence Intervals (LDZ SW) - Full Year**

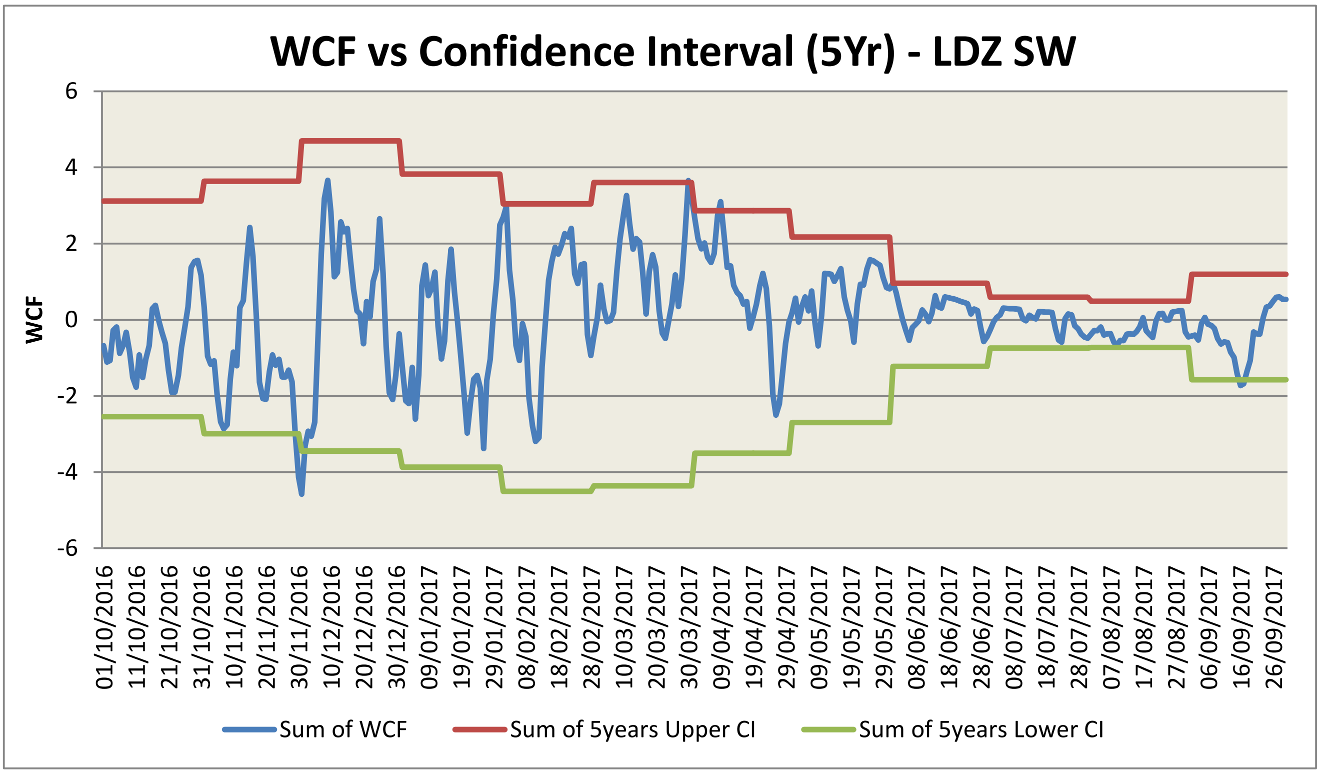


**Figure S12.49 – Percentage of WCF Values within Confidence Intervals for each LDZ/Month**

| 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% |

## 4. STRAND 2: UNIDENTIFIED GAS ANALYSIS

The concept of Unidentified Gas (UiG) was introduced on 1st June 2017 under Project Nexus, which introduced a revised NDM allocation formula bought about by UNC Modification 0432. Unidentified Gas forms part of daily gas allocation and is calculated as the balancing figure to ensure that within in each LDZ, total input matches total output. UiG is derived as follows:

Total LDZ Energy – (Shrinkage + DM Energy + Total LDZ NDM Energy) = UiG

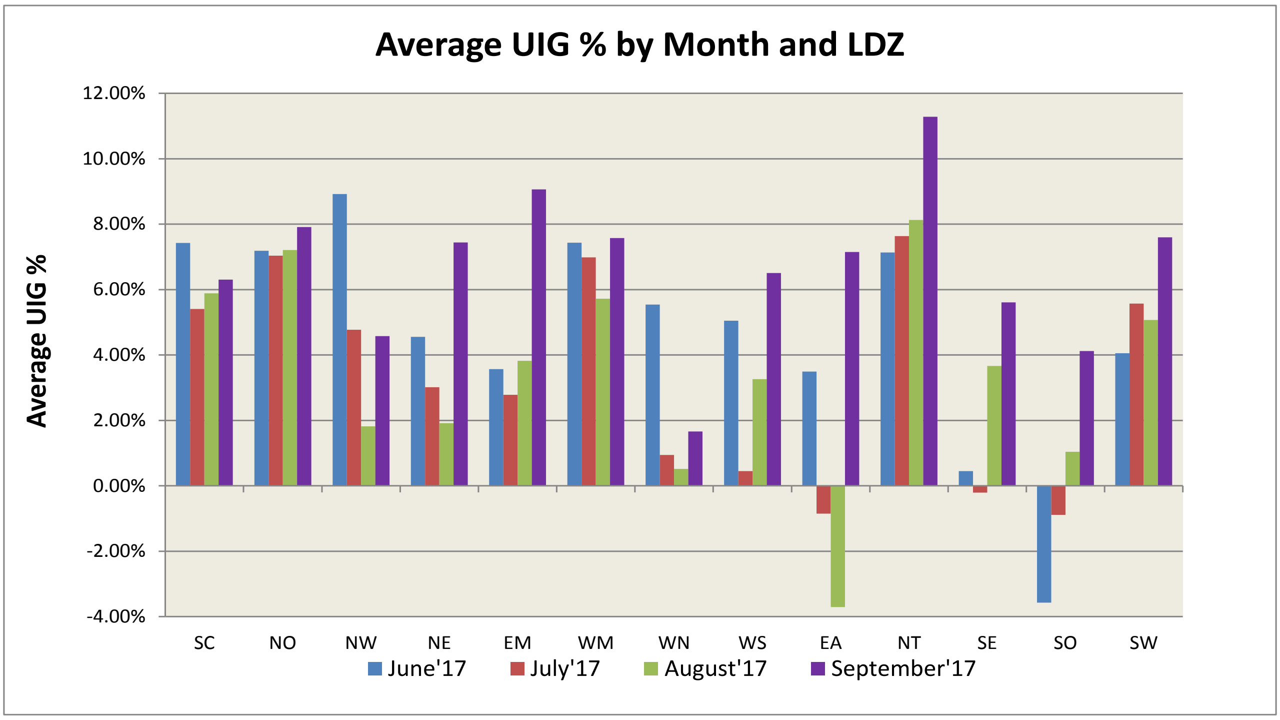
The ideal UiG value is zero but it is worth noting that UiG can be a positive or negative value. UiG volatility may occur for a variety of reasons including imperfections in the NDM Algorithms themselves, but also errors in aggregate NDM AQs and in measured LDZ and DM consumption. If these factors are not material, a positive UiG value could indicate a tendency for the NDM algorithms to under allocate, whereas a negative UiG value could indicate the algorithm over allocates.

A selection of charts are presented below: Figure S12.50 shows the monthly average percentage of Unidentified Gas for each LDZ. Figure S12.51 is a bar chart showing the breakdown of daily throughput from 1st June to 30th September 2017 at a national level and Figures S12.52 to S12.64 show the same throughput breakdown for each of the 13 LDZs.

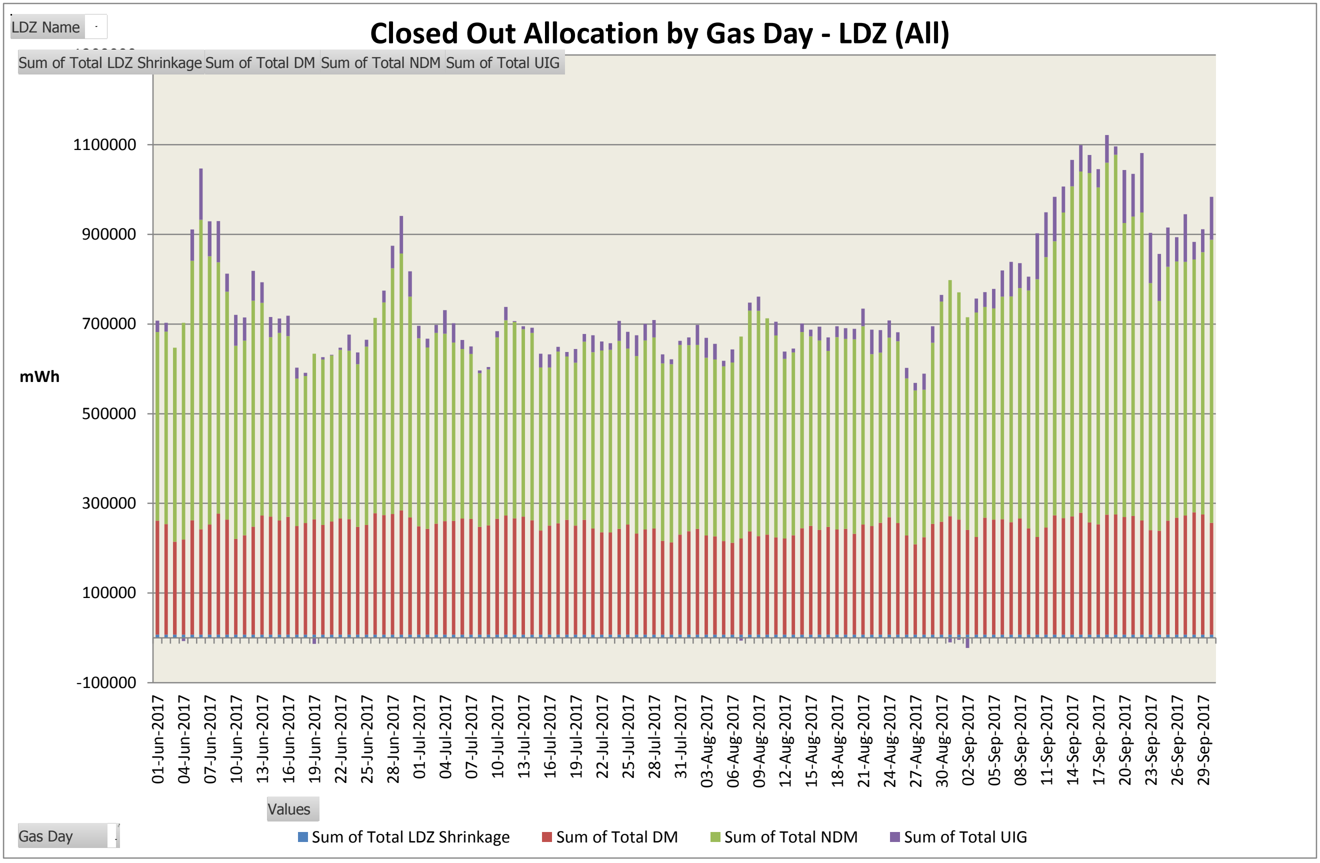
During the analysis period of 1st June 2017 to 30th September 2017, the average UiG percentage levels by month and LDZ have been positive in most cases and have ranged from -3.7% (in EA LDZ during August'17) to +11.3% (in NT LDZ during September'17). When considering the percentage UiG ranges for each individual month, June 2017 ranged from -3.6% to +8.9%, July 2017 ranged from -0.9% to +7.6%, August 2017 -3.7% to 8.1% and September 2017 was +1.7% to +11.3%.

Since its introduction on 1st June 2017, UiG has been somewhat variable with no apparent pattern or consistency in the day to day volatility. As described earlier, UiG volatility can occur for a number of reasons and it has become apparent that some issues have been introduced as a result of the transition to the post Nexus regime. Firstly, enhancements to the validation of DM read submissions resulted in large numbers of actual reads being rejected and system generated estimates being used instead. Additionally, the NDM supply meter point demand formula is using erroneous AQ values for a significant number of NDM sites, as a result of erroneous data feeding the rolling AQ calculation. Performance analysis of the NDM supply meter point demand formula is specifically assessed under Strand 3 'NDM Daily Demand Analysis'.

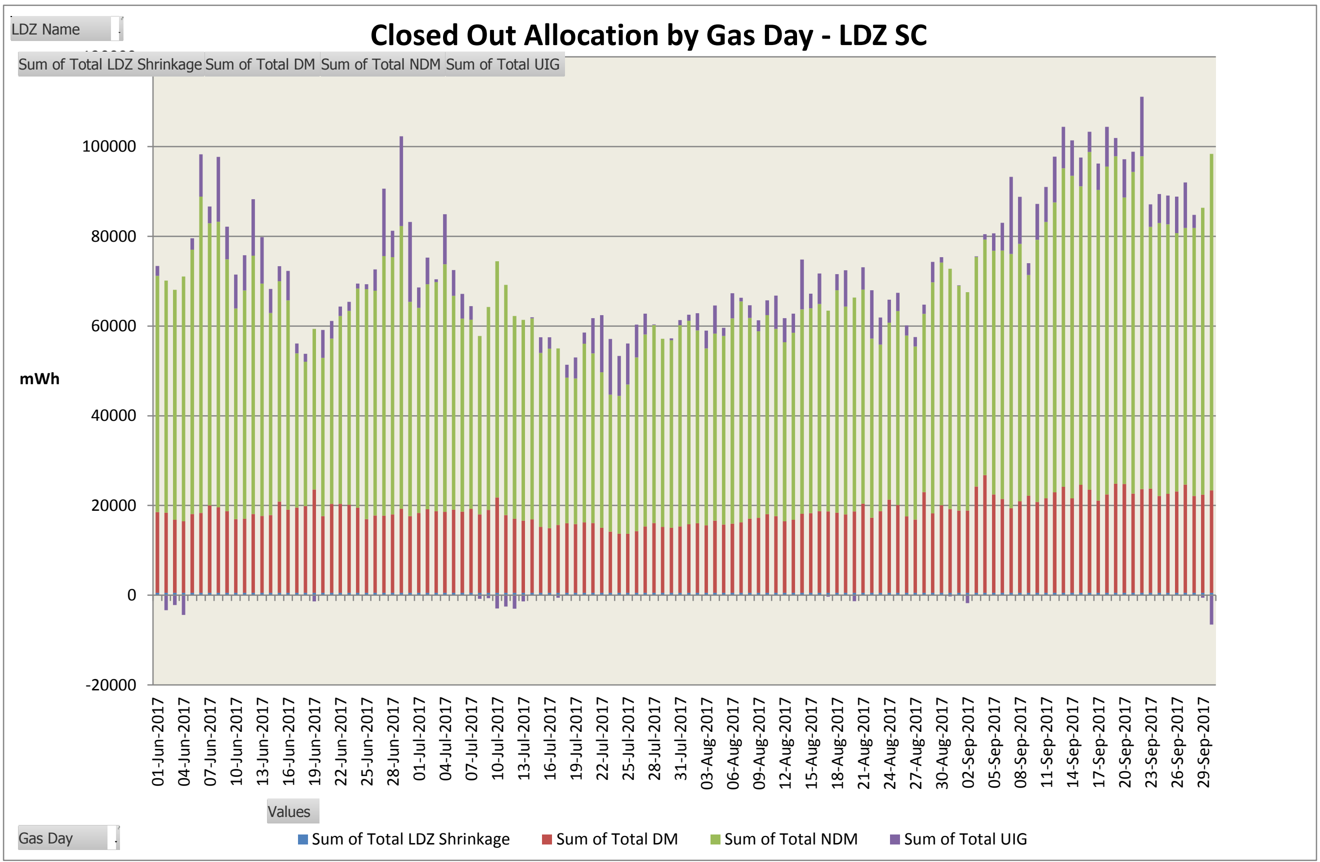
**Figure S12.50 – Total Allocation Breakdown (GB)**



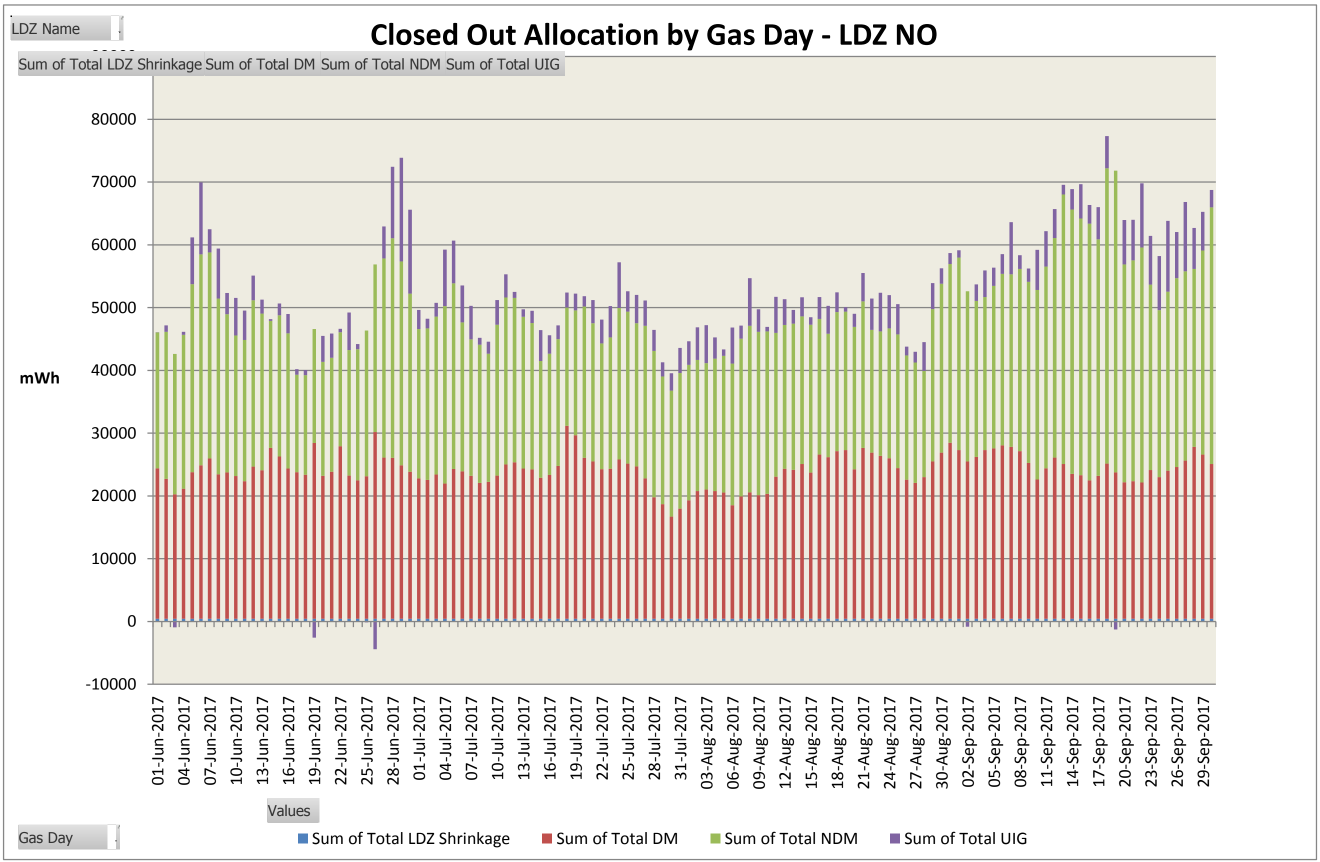
## Figure S12.51 – Total Allocation Breakdown (GB)




## Figure S12.52 – Total Allocation Breakdown (LDZ SC)



## Figure S12.53 – Total Allocation Breakdown (LDZ NO)




## Figure S12.54 – Total Allocation Breakdown (LDZ NW)

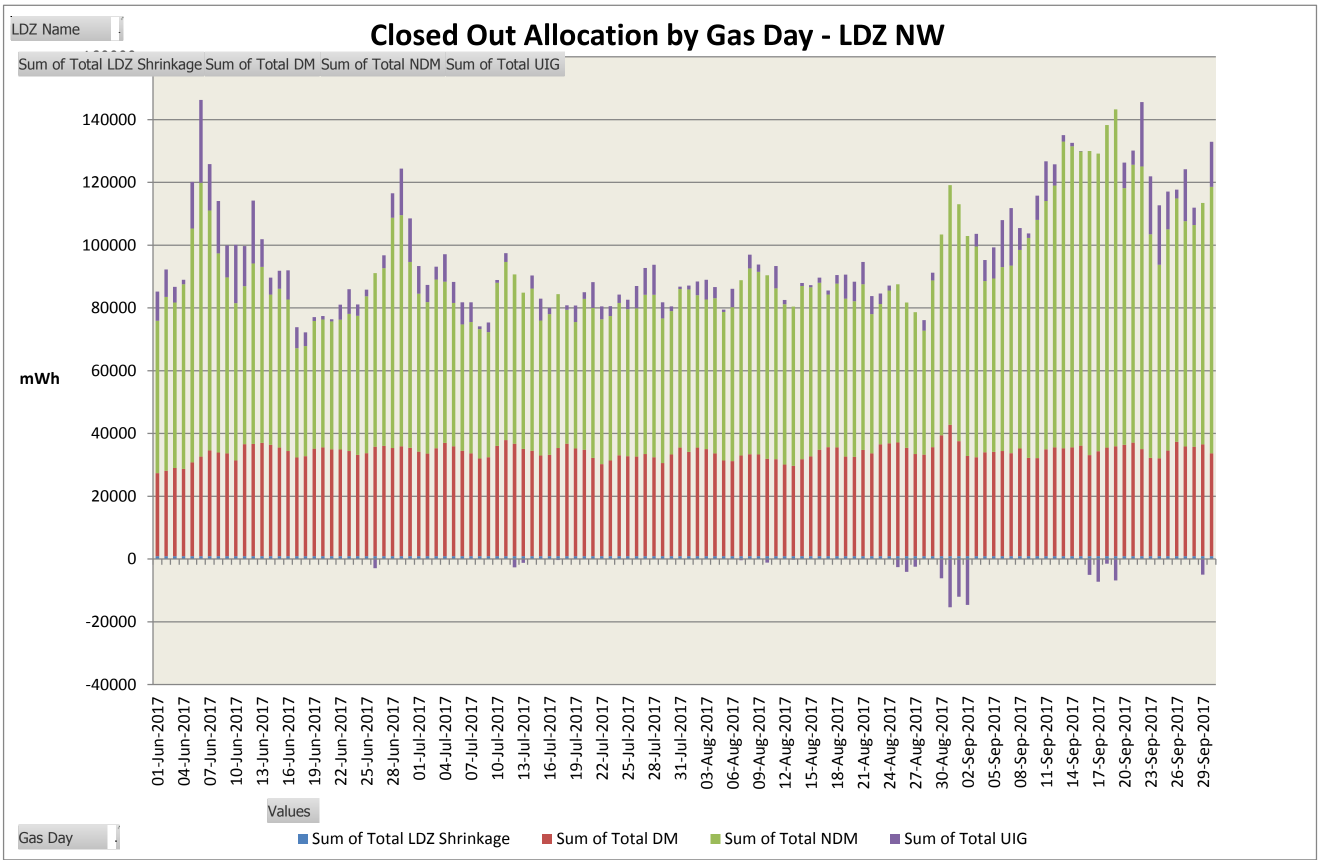


**Figure S12.55 – Total Allocation Breakdown (LDZ NE)**

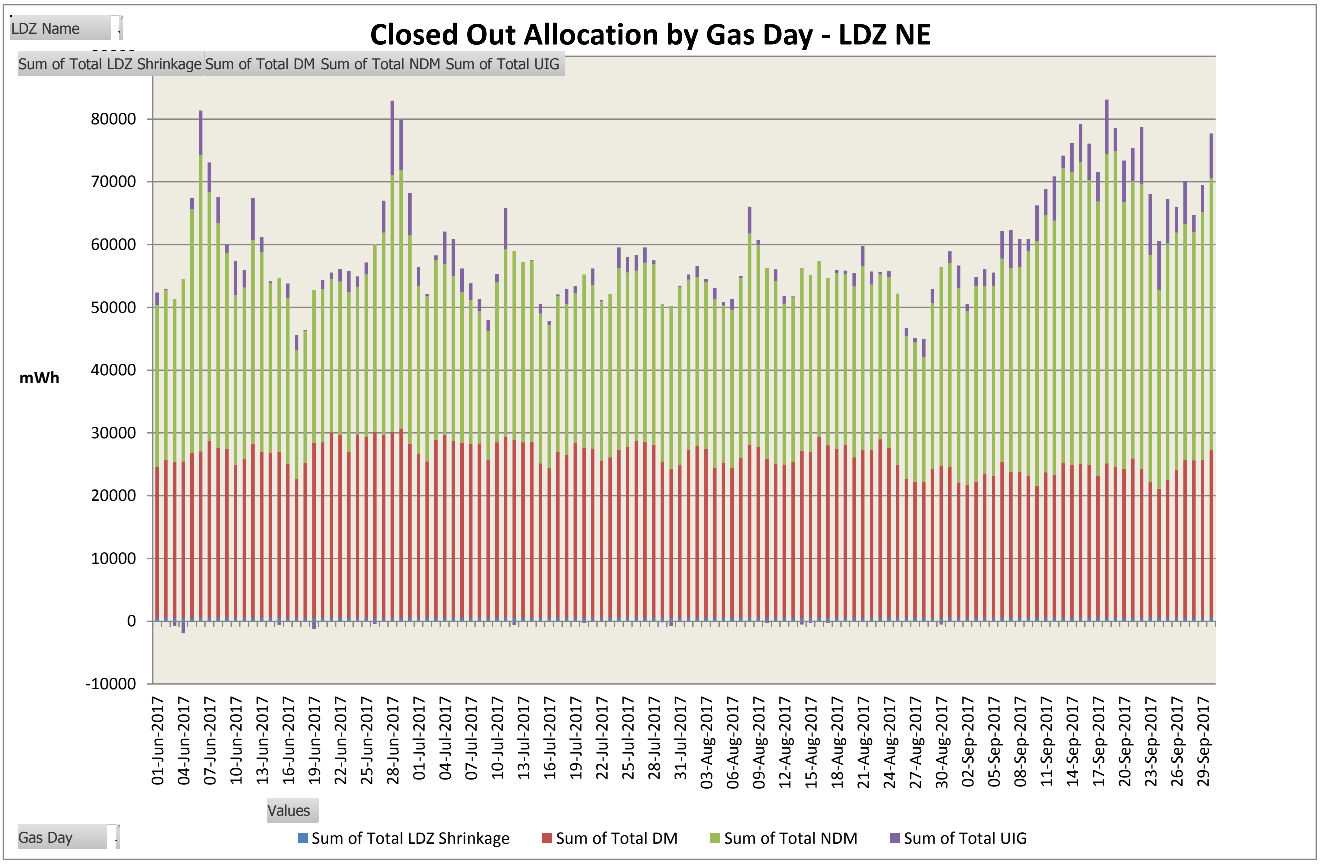



**Figure S12.56 – Total Allocation Breakdown (LDZ EM)**

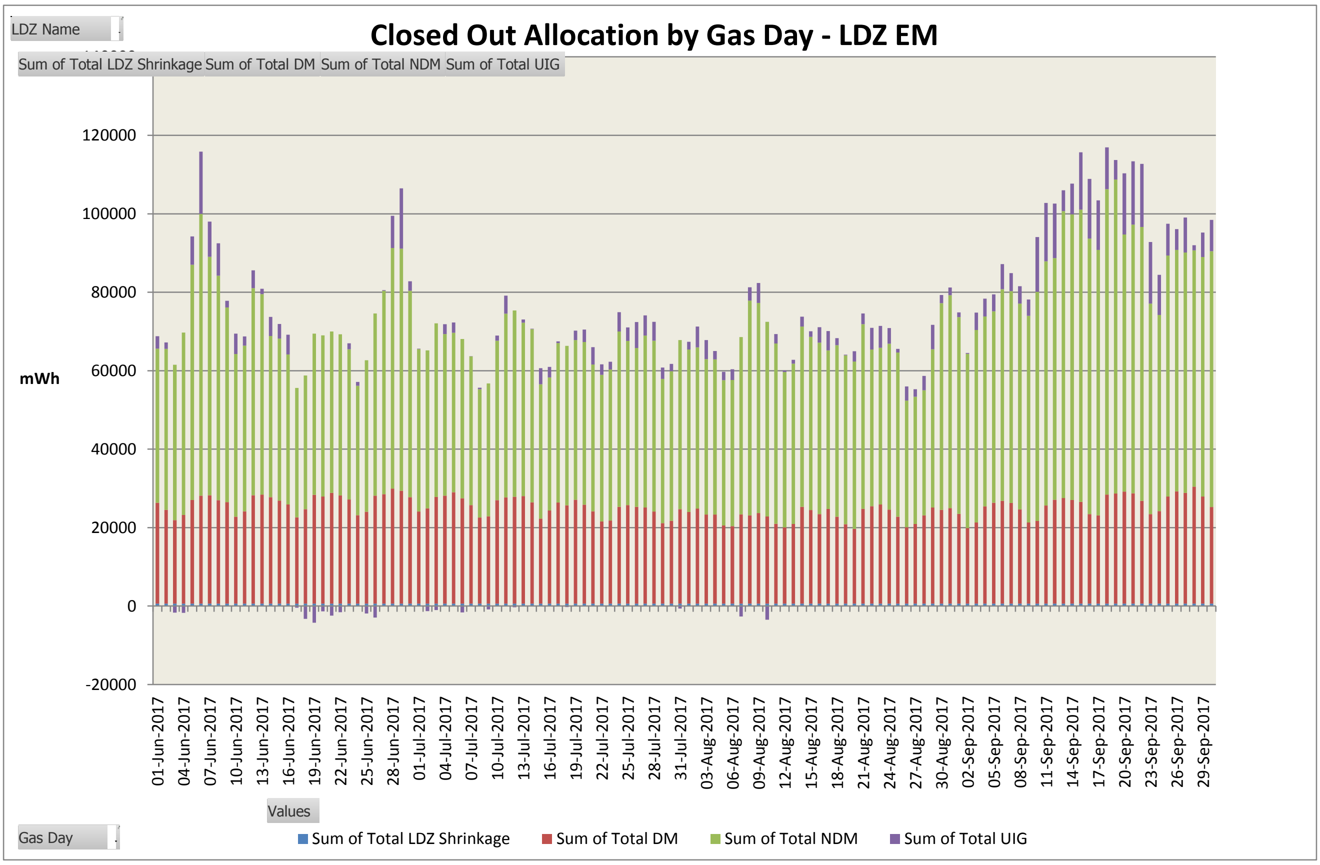


**Figure S12.57 – Total Allocation Breakdown (LDZ WM)**

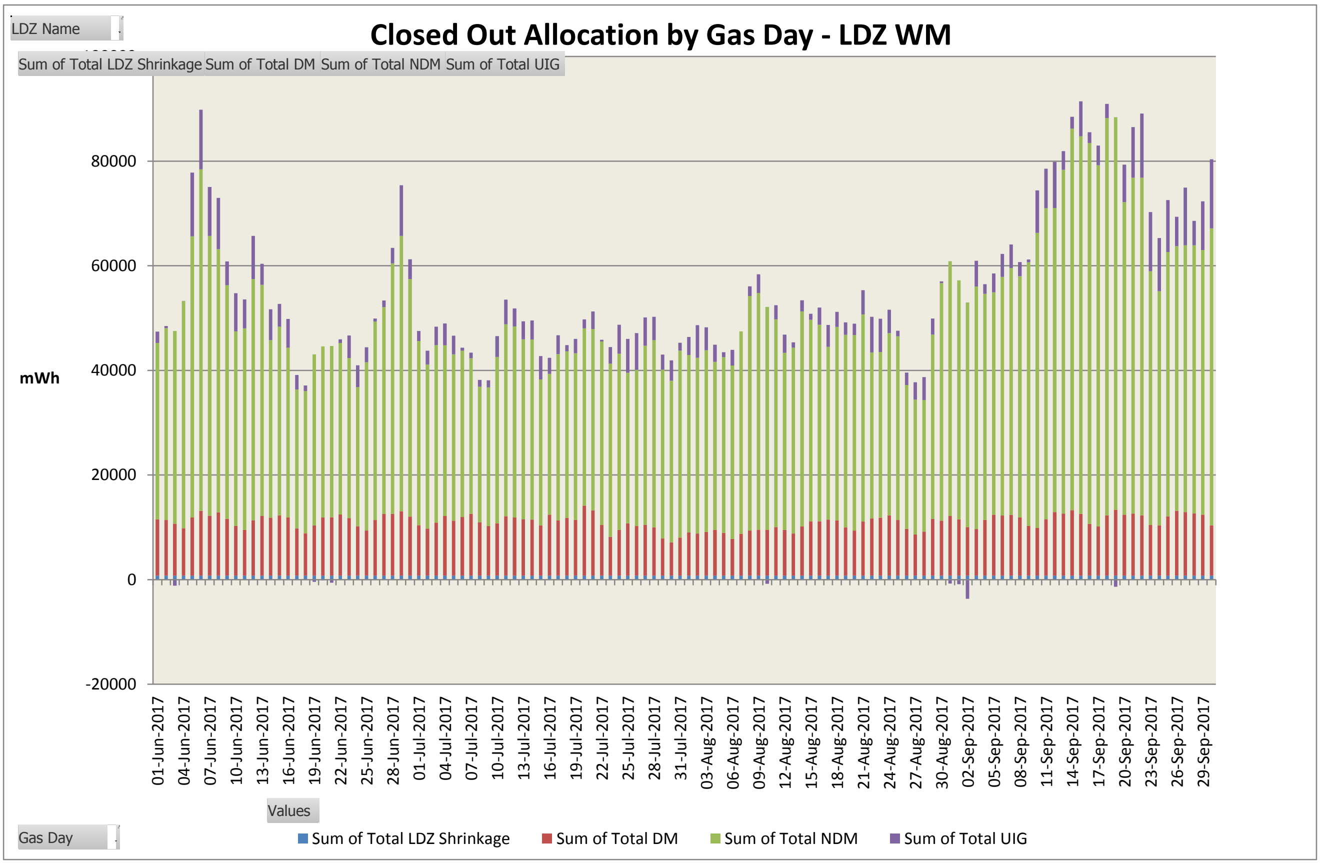
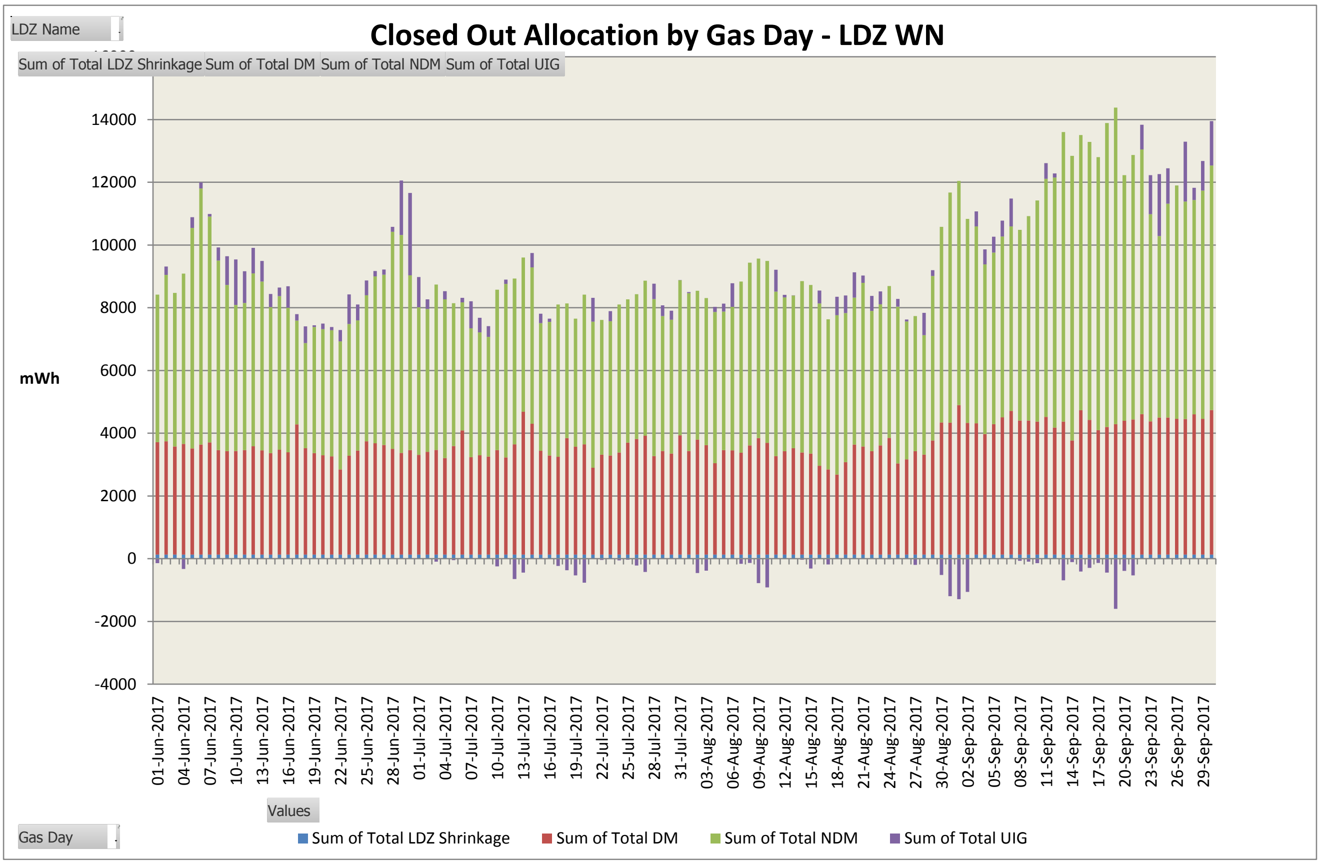
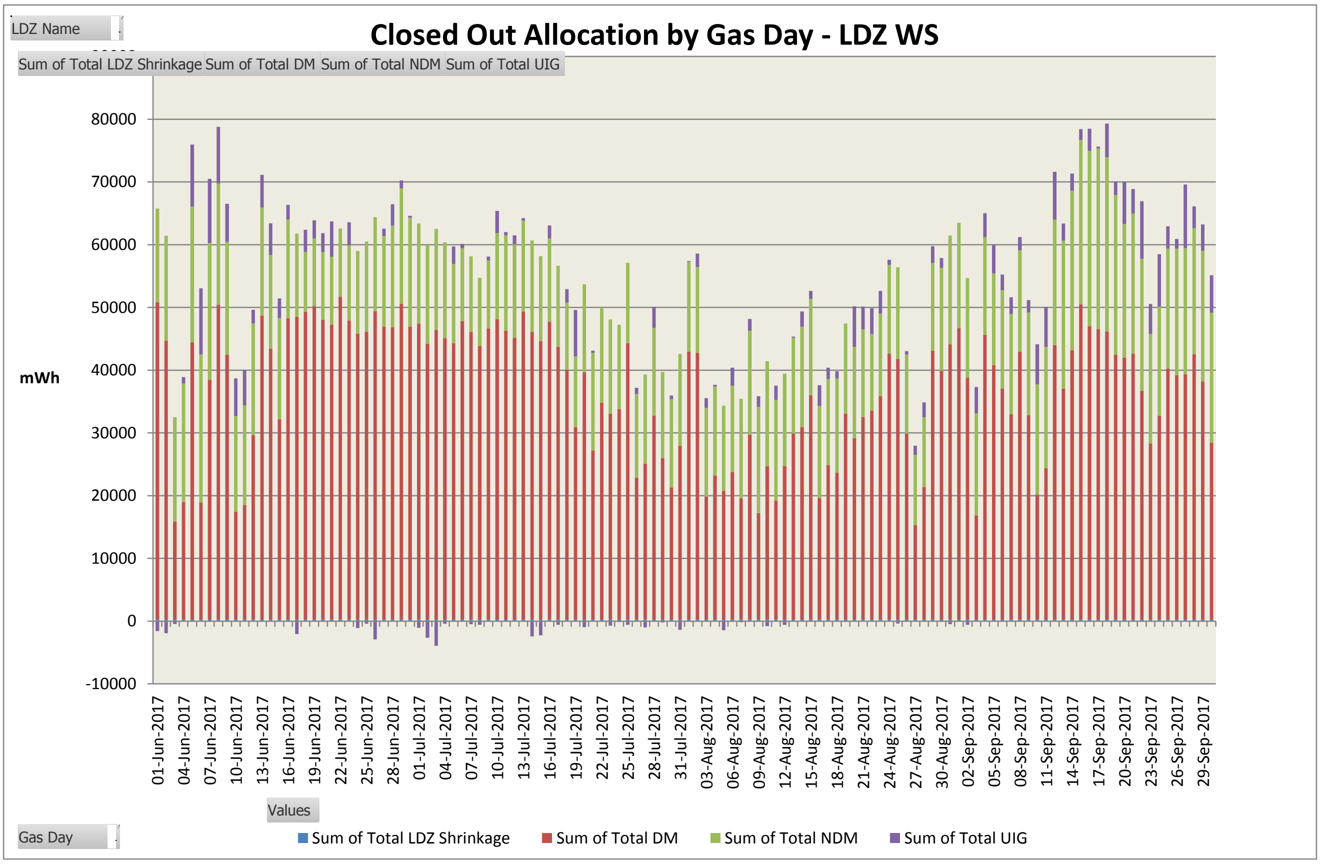



**Figure S12.58 – Total Allocation Breakdown (LDZ WN)**



## Figure S12.59 – Total Allocation Breakdown (LDZ WS)




## Figure S12.60 – Total Allocation Breakdown (LDZ EA)

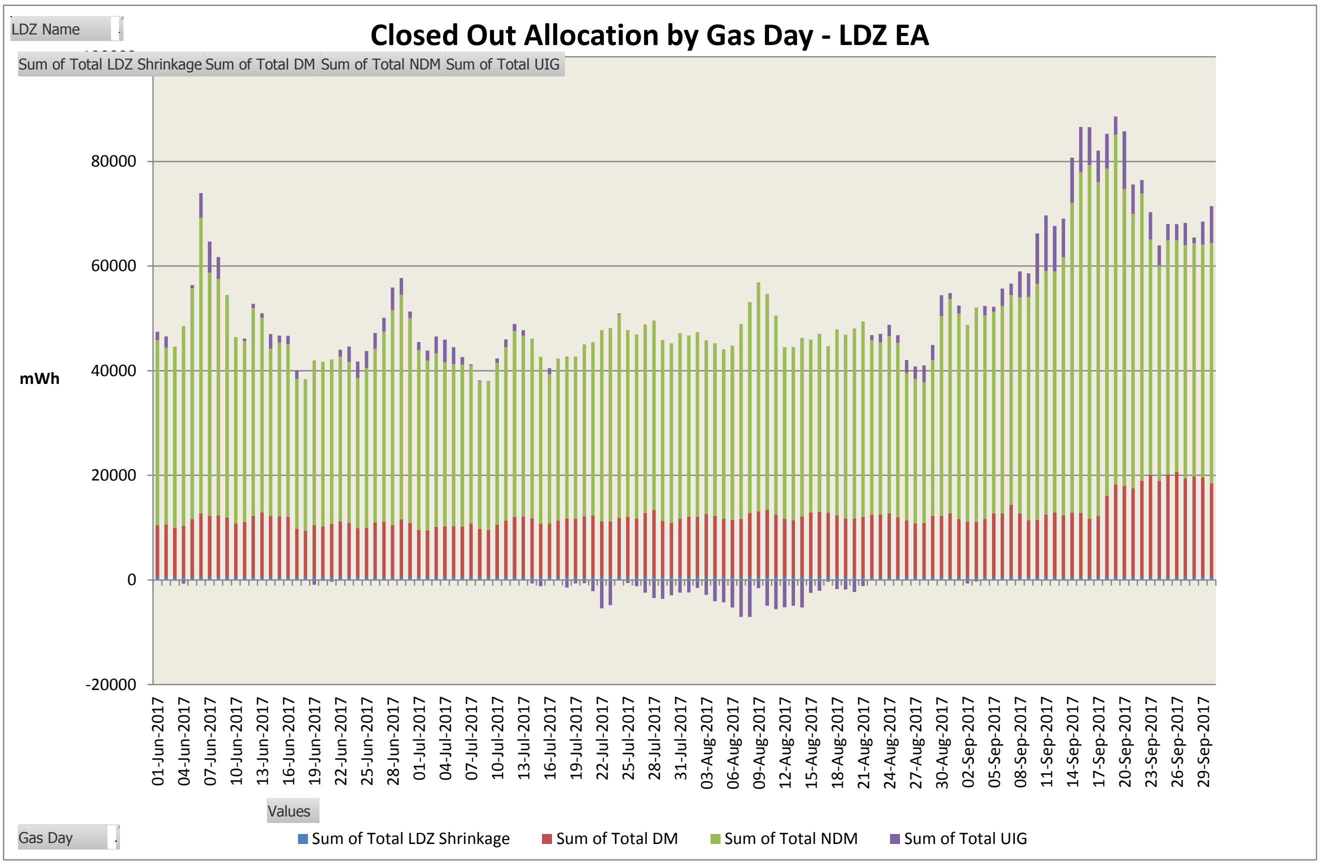


**Figure S12.61 – Total Allocation Breakdown (LDZ NT)**

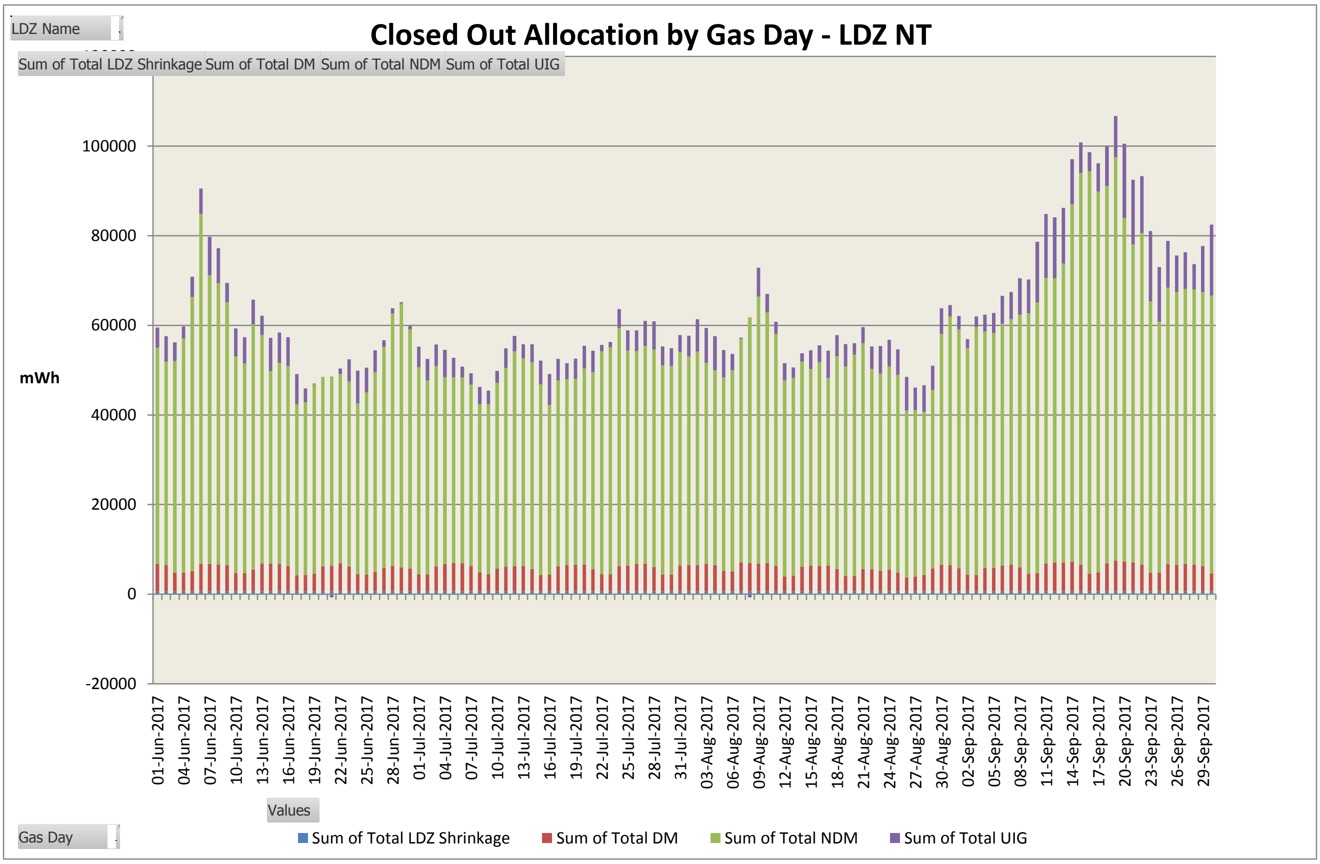



**Figure S12.62 – Total Allocation Breakdown (LDZ SE)**

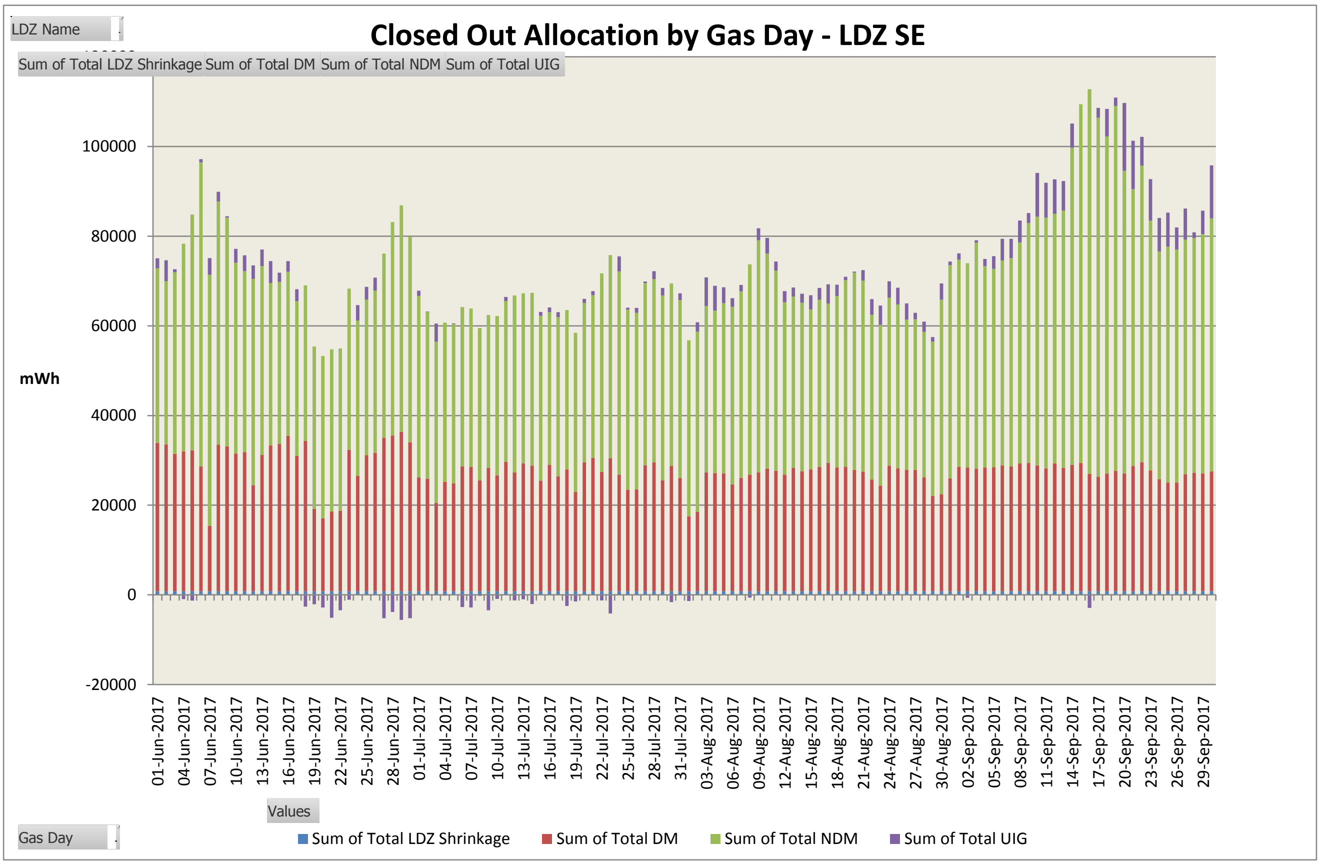


**Figure S12.63 – Total Allocation Breakdown (LDZ SO)**

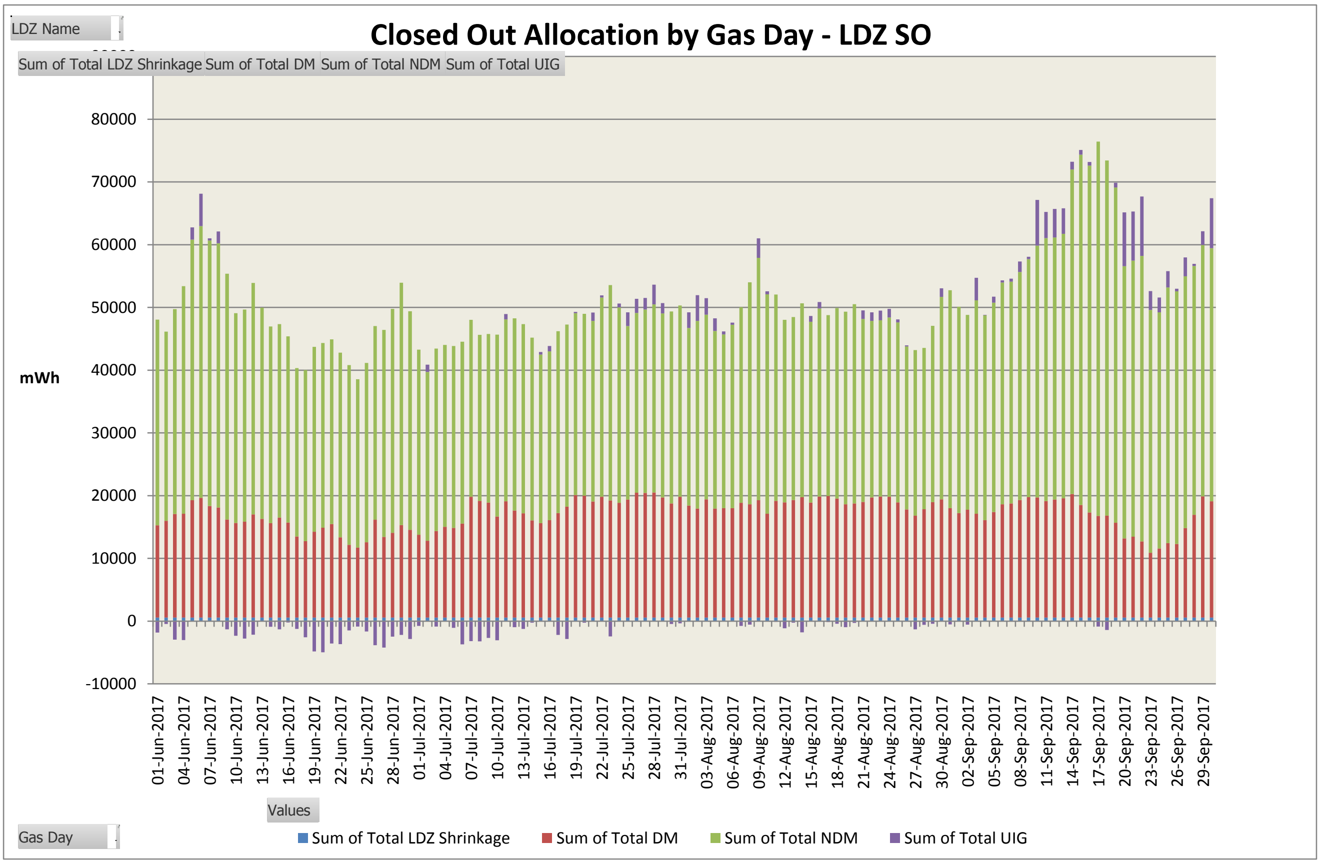



**Figure S12.64 – Total Allocation Breakdown (LDZ SW)**