DESC Nov 2017

Seasonal Normal Review

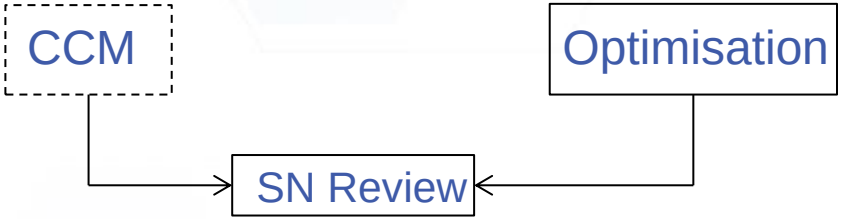
Objective of Meeting

- For DESC members to review analysis of the Climate Change Methodology (CCM) data used within the current calculations of the Seasonal Normal Composite Weather Variable (SNCWV) in order to decide
  - Whether a new CCM is required
  - Whether the existing data set can be used to derive SNCWV for gas years 2020/21 to 2024/25.

- Please see material presented at DESC on the 26th July 2017 for further background information on Seasonal Normal Review.

What is Seasonal Normal Review?

- There are two strands to a Seasonal Normal review:



- **Reviewing the CWV formula**
  - If DESC agree to continue with the current formula, the decision on revising the existing CWV parameters is made. If DESC decide to revise the parameters – the CWV Optimisation process will take place

- **Reviewing the output from the Climate Change Methodology (CCM)**
  - DESC will review the analysis of the CCM datasets and make the decision on whether to continue with the existing CCM (and extend the period of data) or if a new CCM is required
  - a new CCM project would need to be approved by the DSC Change Management Committee and would need a business justification

Climate Change Methodology (CCM) Background

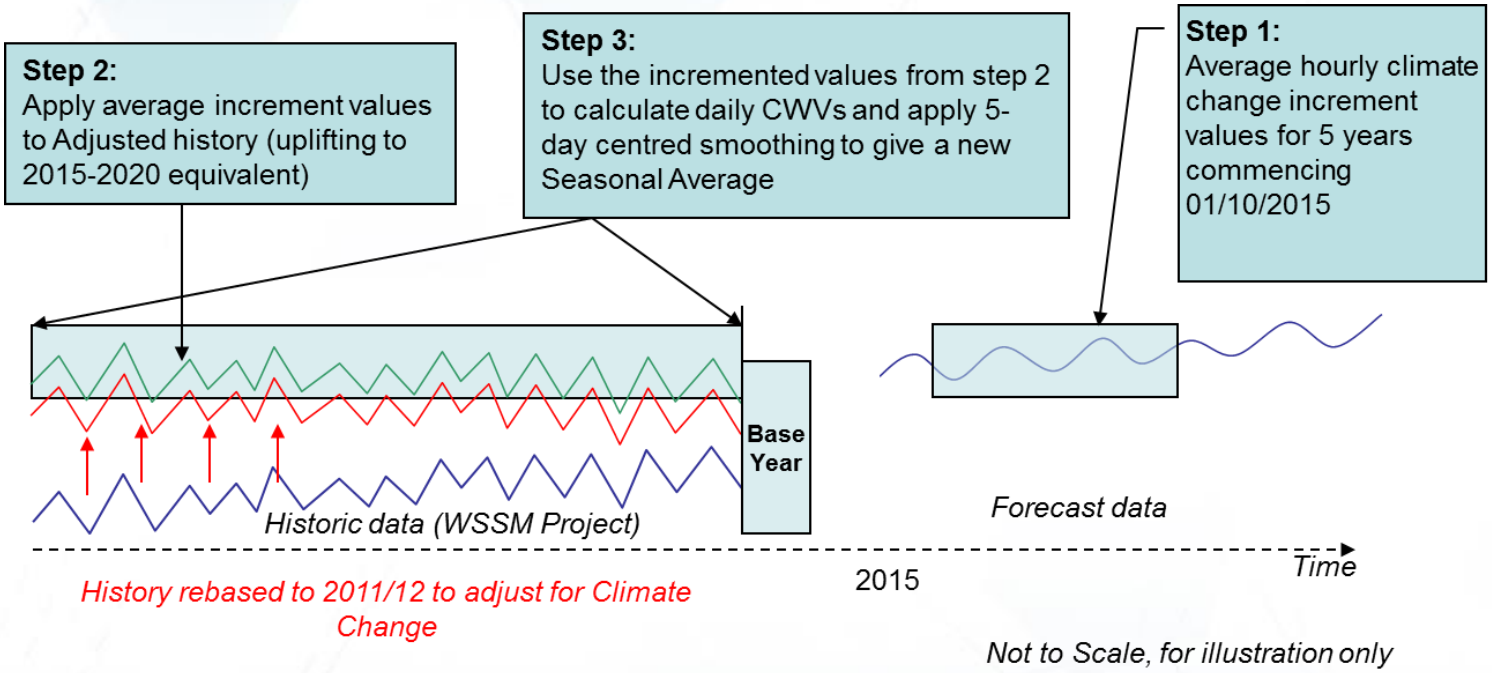
- For the 2015 Seasonal Normal Review, the meteorological services company selected to develop the CCM was the Met Office.

- The Met Office delivered both a methodology document and a series of data outputs reflecting a set of technical requirements developed by DESC

- The data outputs (by weather station) included the following:
  - Predicted hourly climatological average values for 1st Oct 2012 to 30th Sep 2025.
  - Predicted hourly increment values (difference between the above values and the base year (2011/12) averages.
  - An adjusted view of historic hourly weather datasets from 1st Oct 1960 to 30th Sep 2012.
  - Confidence intervals for the predicted hourly climatological values

Methodology of deriving the SNCWV

The diagram below shows a high level of how the SNCWV should be calculated.



Current CCM

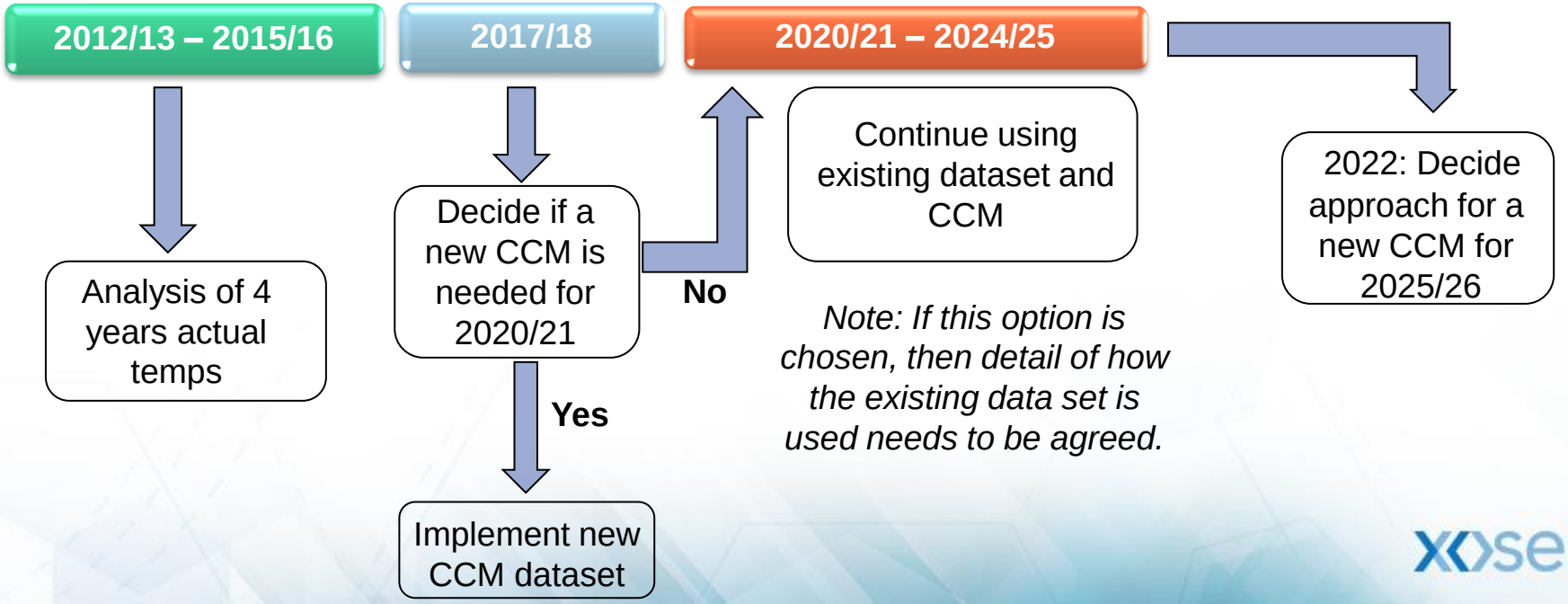
The main features of the current approach for deriving the SNCWV are:

- Base year is 2011/12
- The period agreed to base the average increments on was 5 years. CCM temperature increments over the period 2015/16 to 2019/20 were averaged
- The averaged increment values were applied to the CCM adjusted history (1960/61 to 2011/12)
- The CCM adjusted history for temperature (with increments added) and wind speed (no increments) are used to calculate a CWV for each day in the period 1st October 1960 to 30th September 2012
- In order to create a single CWV value for each day average the CWV values and then smooth using a 5 day centred moving average

Data Sets Used to Derive Current SNCWV

CCM Projections – Existing Data 01/10/12 – 30/09/2025

**note: CCM Projections are "predicted hourly climatological average values based on predicted impact of climate change trends for future periods"*



Action DESC0703

Xoserve to update DESC members on results of analysis of suitability of current CCM

- The Climate Change Methodology used the following models:
  - QUMP (Quantifying uncertainty in model predictions – Met Office) – no plans to update this at present but the UKCP18 (2018) will produce an updated set of UK climate projections
  - CMIP (Coupled Model Inter-comparison project) this is still current, but CMIP6 runs are in progress - model output/evaluation will be available within a 2-3 year timescale
- In summary, there is limited new modelling available at present within the Met Office on which to base an update to the CCM

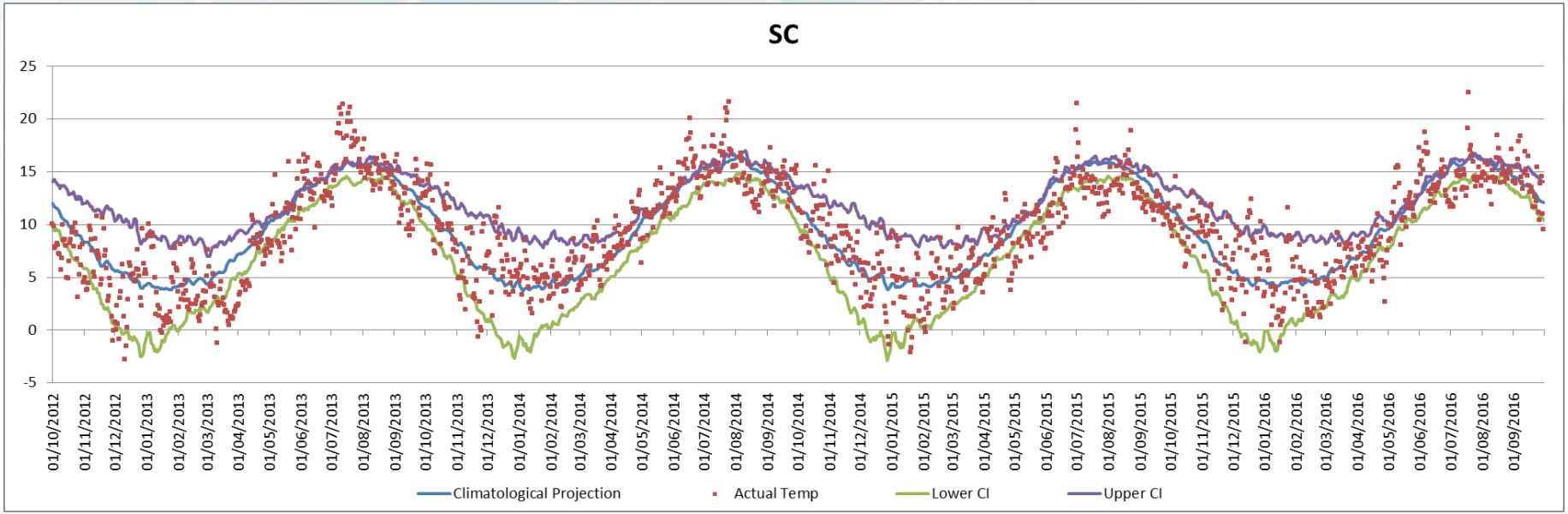
Analysis Approach

- At the previous DESC meeting, members agreed on the following analysis of the current CCM data set:
- Gas years to be analysed:
  - 2012/13
  - 2013/14
  - 2014/15
  - 2015/16
- Analysis by the 9 weather station groupings as stated in the *DESC Approach to derivation of new Seasonal Normal Basis for 1 October 2015 onwards*.
- Analysis to include:
  - Analysis of the actual daily temperatures against the predicted hourly climatological average confidence limits. As hourly confidence intervals are provided, the max and min values for the day were used to gain the upper and lower limits for the day.
  - Monthly average comparison of Predicted Climatological values against the daily actual temperatures (which are used to calculate the CWVs) by weather station – a daily comparison would not be a fair approach due to the climatological average values being smoothed.

Data Used in Analysis

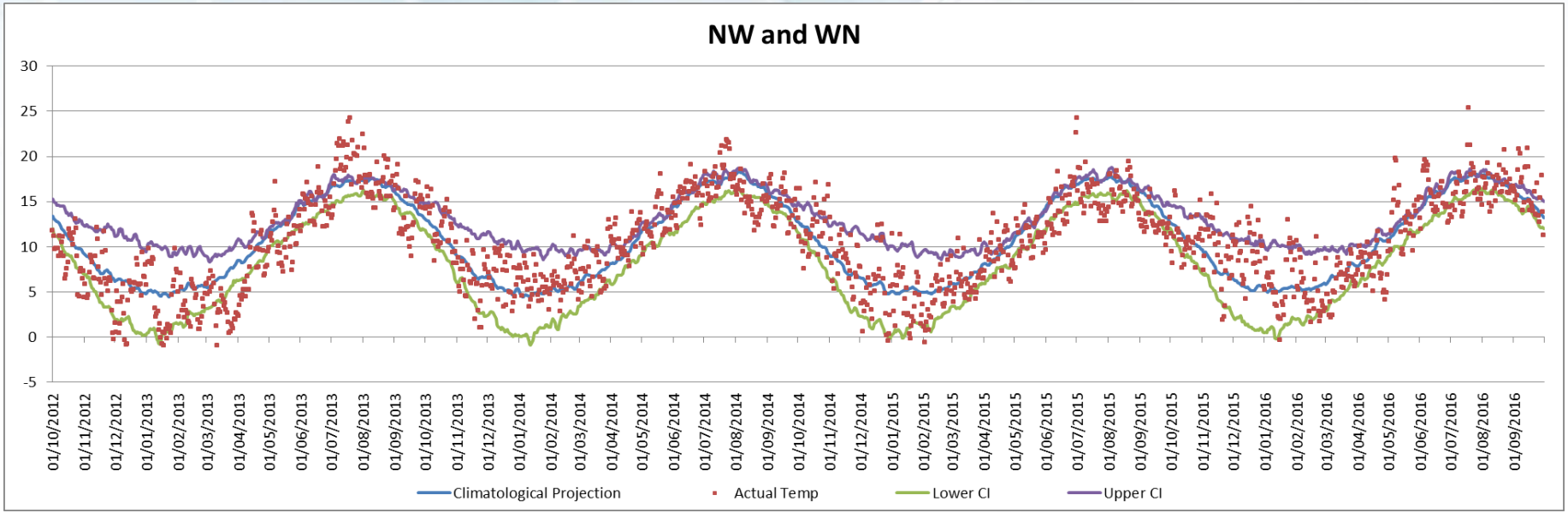
- The datasets we have are as follows:
  - Adjusted history
  - Predicted hourly increments
  - Predicted hourly climatological average values
  - The files above and their associated read me files can be located on the secured shared area – Folder 18 – Climate Change Methodology.
- The adjusted history and predicted hourly increments are used to calculate the SNCWV (as described in the *'Final Approach to Seasonal Normal Basis 2015'*).
- Equivalent daily actual temperatures which are used to calculate the CWVs.
- Predicted climatological values are hourly and were converted to local time before converting to a daily value as per the gas industry weightings and timings (i.e. the gas day runs from 5am to 5am).
- The confidence intervals for the predicted hourly climatological values.

Confidence Intervals Analysis – SC (Bishopton)



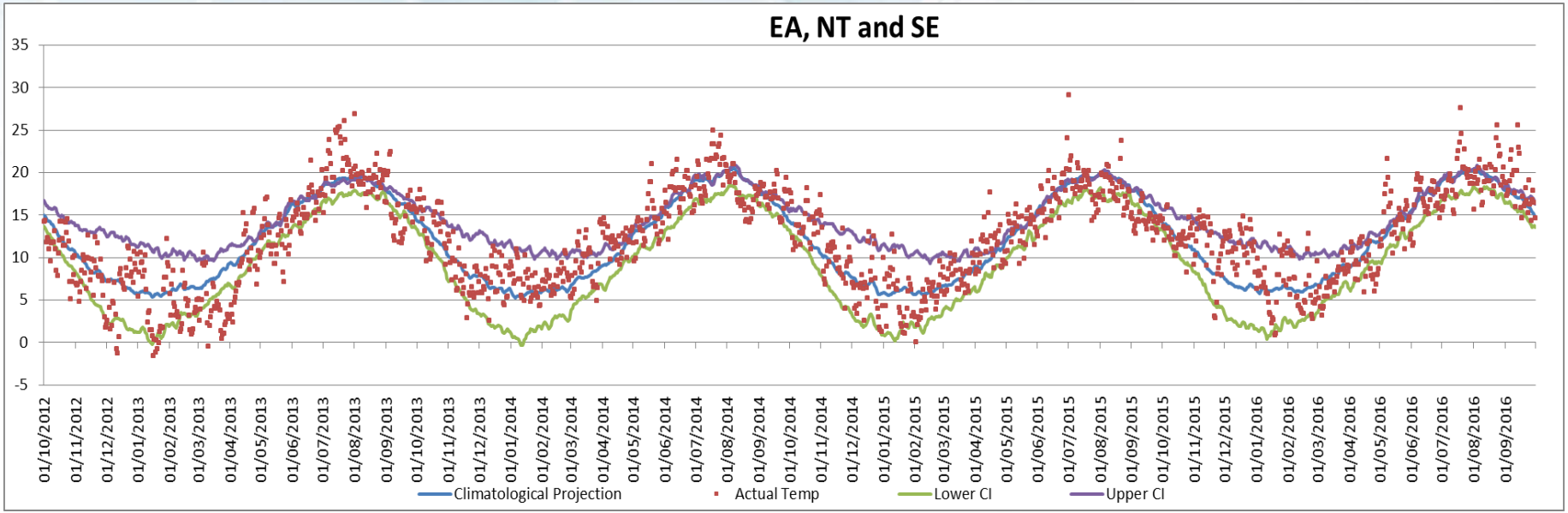
62% of the actual temps were within the confidence intervals over the 4 gas years.
16% of the time the actual temps were above the confidence intervals
22% of the time the actual temps were below the confidence intervals

Confidence Intervals Analysis – NW & WN (Rostherne No.2)



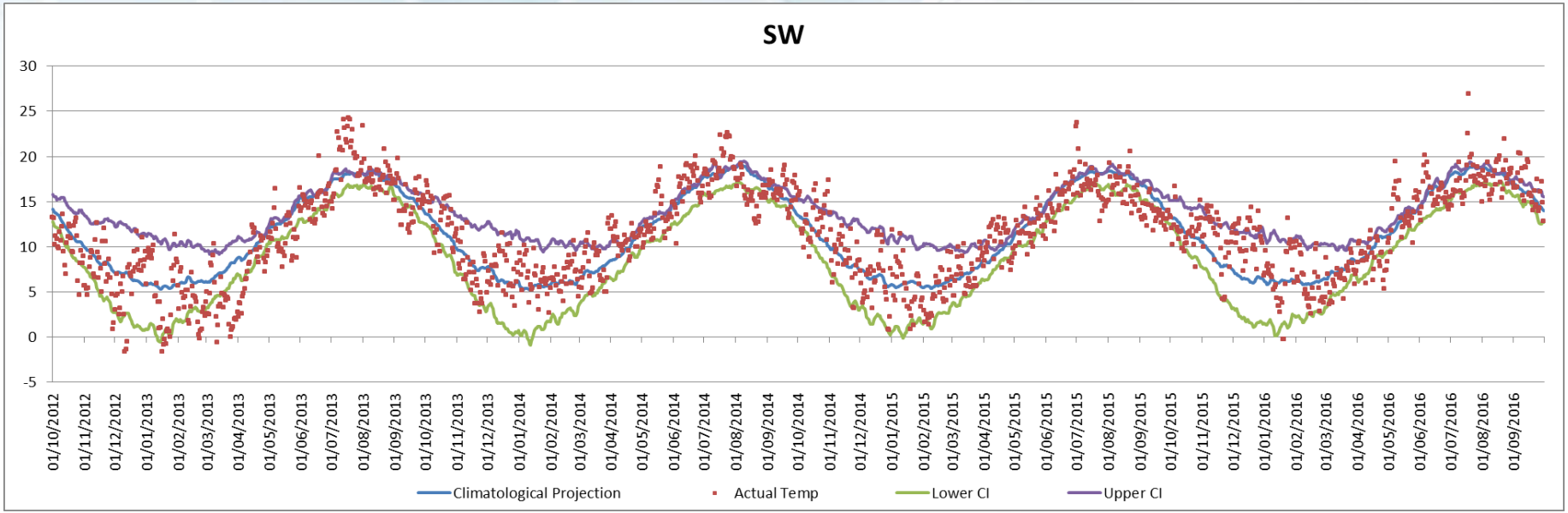
56% of the actual temps were within the confidence intervals over the 4 gas years.
20% of the time the actual temps were above the confidence intervals
24% of the time the actual temps were below the confidence intervals

Confidence Intervals Analysis – EA, NT & SE (Heathrow)



58% of the actual temps were within the confidence intervals over the 4 gas years.
24% of the time the actual temps were above the confidence intervals
18% of the time the actual temps were below the confidence intervals

Confidence Intervals Analysis – SW (Filton)



61% of the actual temps were within the confidence intervals over the 4 gas years.
20% of the time the actual temps were above the confidence intervals
19% of the time the actual temps were below the confidence intervals

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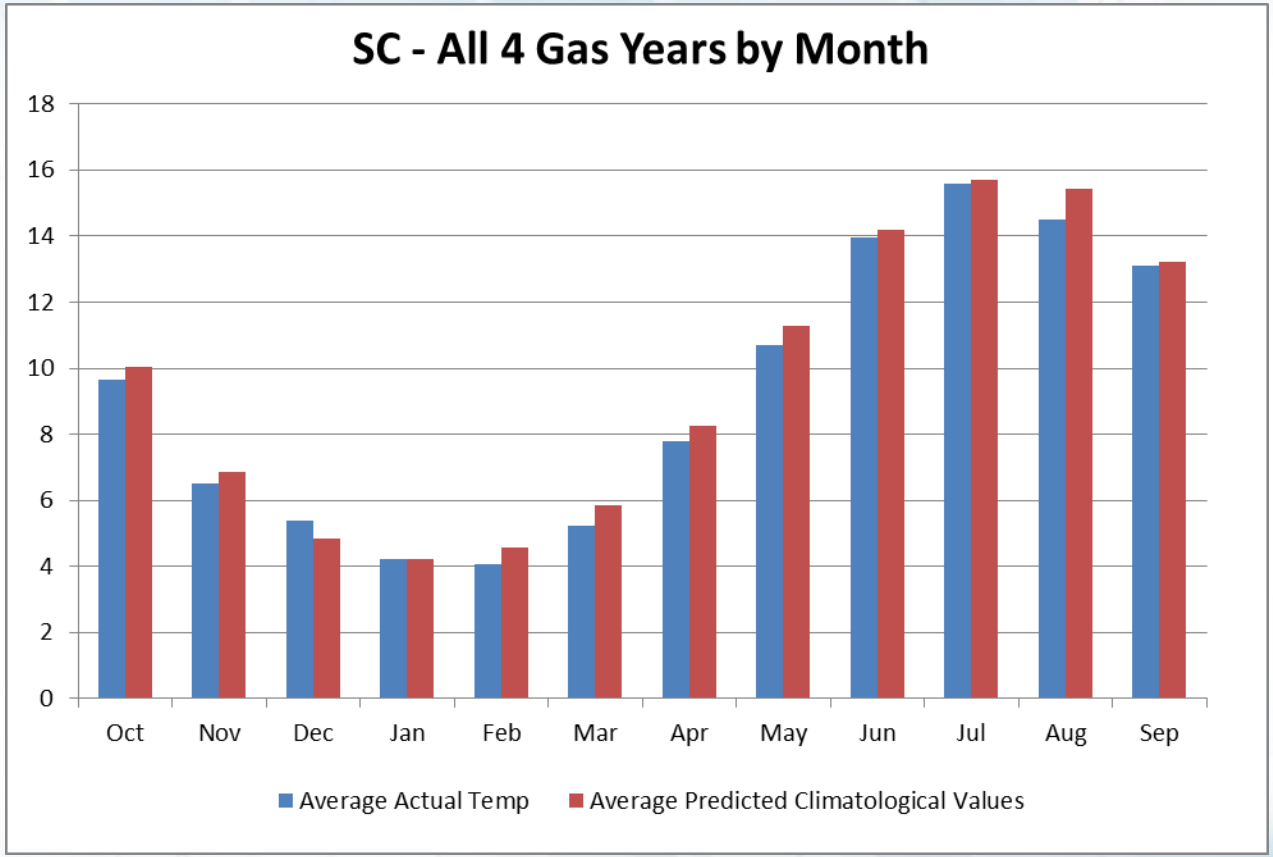
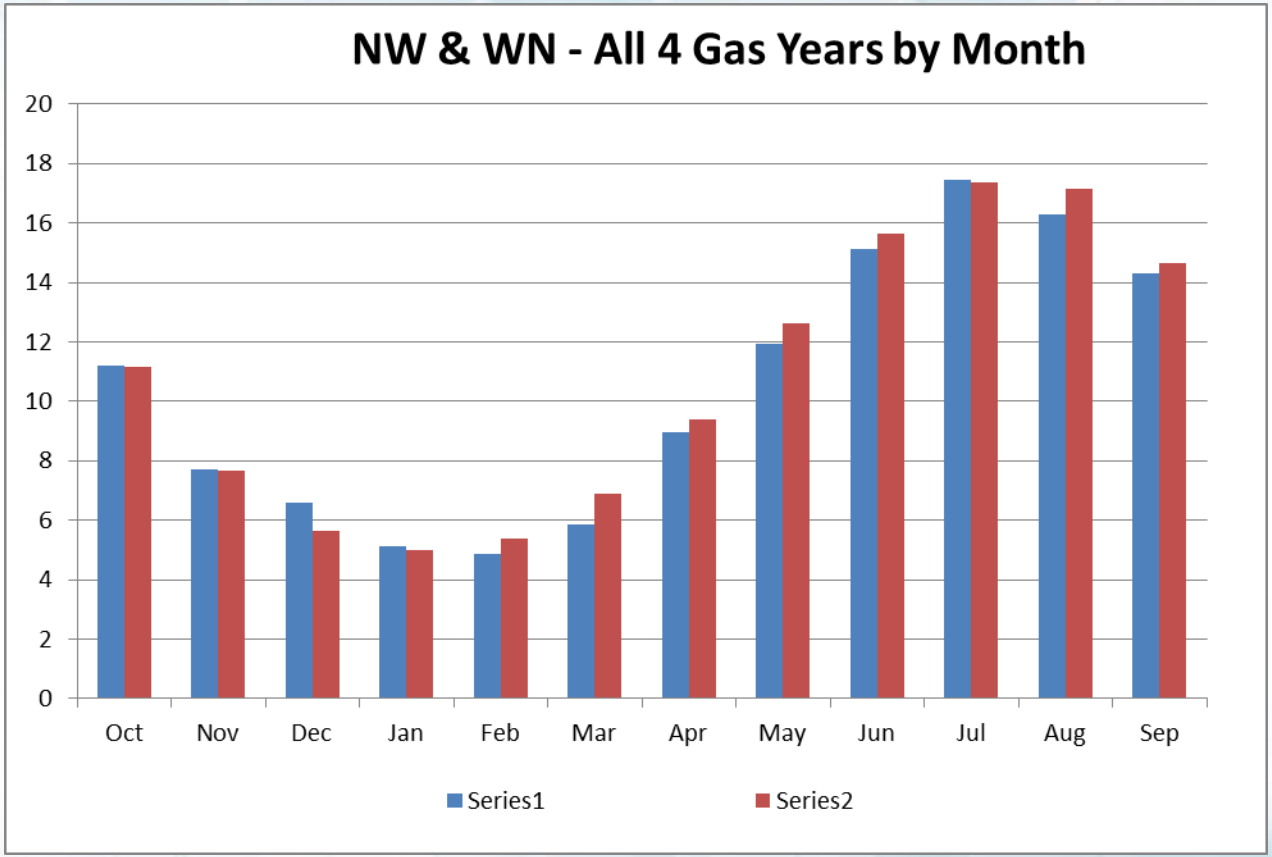
Monthly Average Temperature Comparisons SC



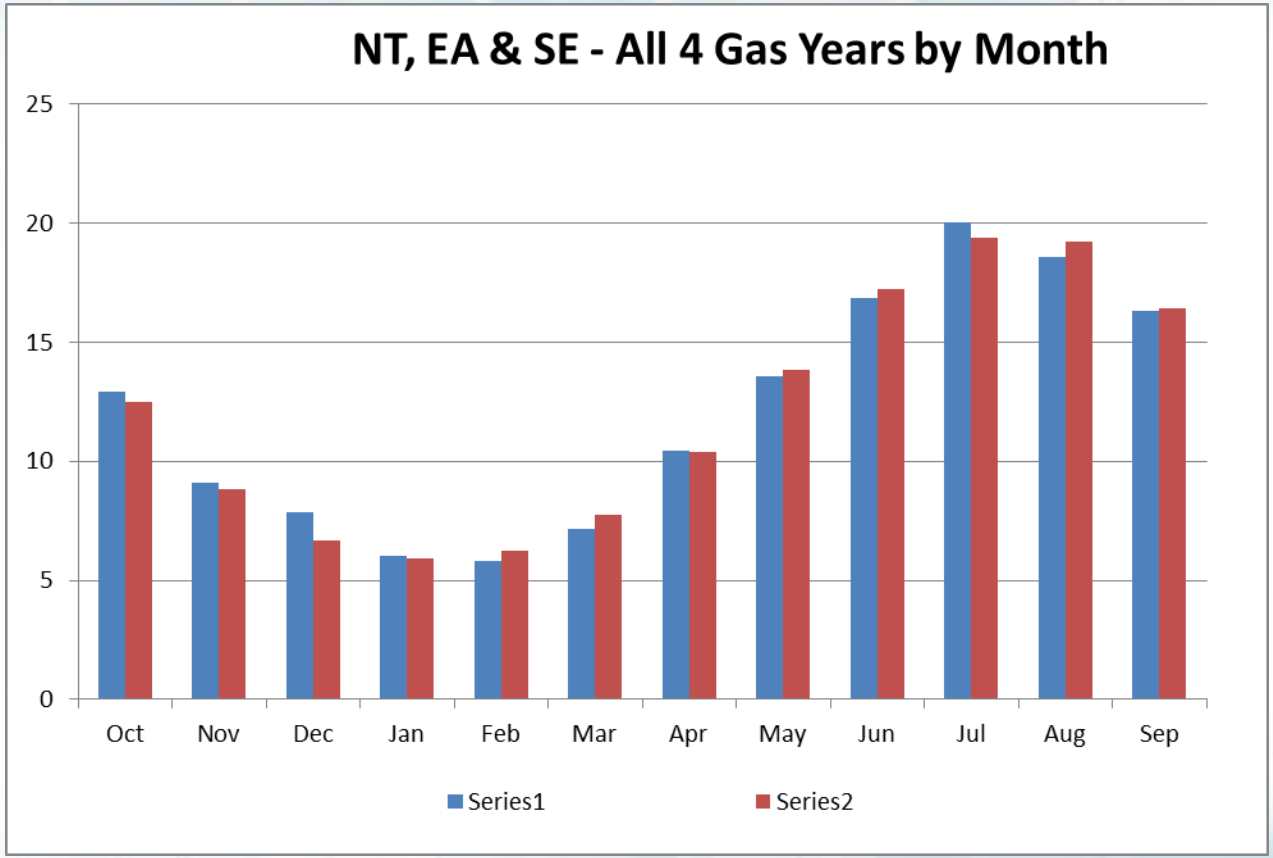
11 out of 12 months, the average actual temps were colder than the average climatological predicted values.

Monthly Average Temperature Comparisons NW & WN



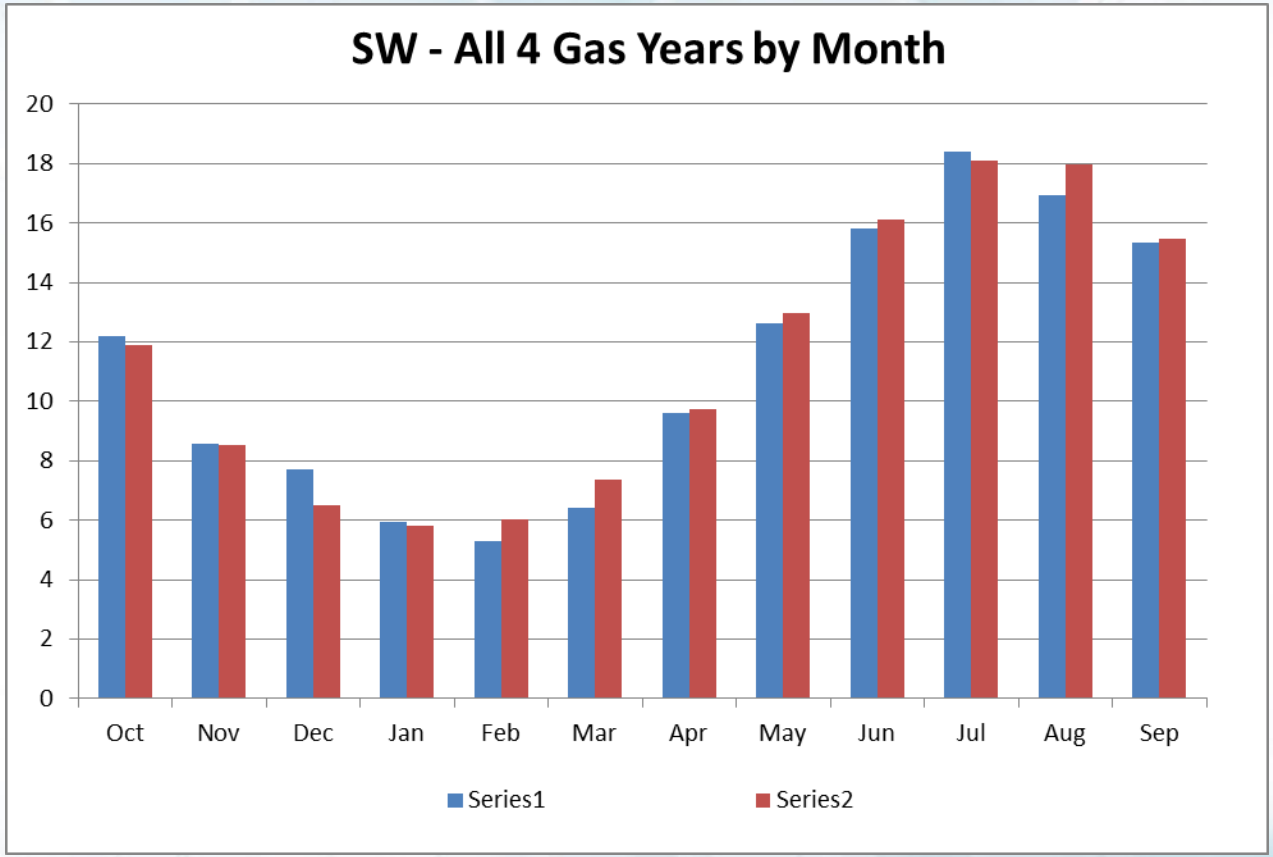
7 out of 12 months, the average actual temps were colder than the average climatological predicted values.

Monthly Average Temperature Comparisons – NT, EA & SE



6 out of 12 months, the average actual temps were colder than the average climatological predicted values.

Monthly Average Temperature Comparisons - SW



7 out of 12 months, the average actual temps were colder than the average climatological predicted values.

Monthly Average comparisons

Month	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	WN
Oct	-0.39	0.08	0.03	0.23	0.23	0.18	0.66	0.41	0.41	0.41	0.50	0.27	0.03
Nov	-0.35	0.09	0.01	0.22	0.22	0.04	0.46	0.25	0.25	0.25	0.25	0.03	0.01
Dec	0.53	0.92	0.95	1.10	1.10	0.97	1.47	1.15	1.15	1.15	1.21	1.18	0.95
Jan	-0.01	0.16	0.13	0.08	0.08	-0.20	0.49	0.09	0.09	0.09	0.35	0.15	0.13
Feb	-0.49	-0.34	-0.52	-0.35	-0.35	-0.69	-0.41	-0.45	-0.45	-0.45	-0.53	-0.74	-0.52
Mar	-0.62	-0.55	-1.01	-0.78	-0.78	-1.08	-0.78	-0.61	-0.61	-0.61	-0.74	-0.95	-1.01
Apr	-0.47	-0.25	-0.43	-0.01	-0.01	-0.24	-0.16	0.04	0.04	0.04	-0.23	-0.16	-0.43
May	-0.58	-0.16	-0.70	-0.31	-0.31	-0.55	-0.28	-0.26	-0.26	-0.26	-0.28	-0.36	-0.70
Jun	-0.24	-0.30	-0.55	-0.53	-0.53	-0.52	-0.17	-0.36	-0.36	-0.36	-0.12	-0.32	-0.55
Jul	-0.12	0.31	0.08	0.40	0.40	0.27	0.20	0.65	0.65	0.65	0.55	0.28	0.08
Aug	-0.95	-0.36	-0.88	-0.58	-0.58	-0.87	-0.71	-0.61	-0.61	-0.61	-0.61	-1.06	-0.88
Sep	-0.10	0.00	-0.36	-0.17	-0.17	-0.27	0.17	-0.12	-0.12	-0.12	0.08	-0.11	-0.36
LDZ	-0.32	-0.03	-0.27	-0.06	-0.06	-0.25	0.08	0.01	0.01	0.01	0.04	-0.15	-0.27

The above table shows the difference between the average actual temps (for 4 years) and the average climatological predicted values (for 4 years).
Note: Dec 2015 was the warmest December in the last 50 years.

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T-test Results

- 4 years of data
- Average actual temperature vs. Average Projected Temperature
- 48 observations within each LDZ grouping – one average value for each month

LDZ	(F-Test) Equal variances	(T-test) Equal means	Actual is warmer than projected on average	Actual is colder than projected on average
SC	✓	✓		✓
NO	✓	✓		✓
NW & WN	✓	✓		✓
NE & EM	✓	✓		✓
WM	✓	✓		✓
WS	✓	✓	✓	
EA, NT & SE	✓	✓	✓	
SO	✓	✓	✓	
SW	✓	✓		✓

- Results suggest that there is no significant difference between the average actual temperature and the average projected temperature.
- The projected temps for the majority of weather stations are warmer in comparison the actual temps.

Conclusions and Recommendations

- The analysis suggests there is no significant difference between the average actual temperatures and projected temperatures for the 4 years analysed.

- Xoserve's recommendation is to continue with the current dataset and review the data again in 2022.

- If DESC decide to implement a new CCM dataset, the timetable for this work is summarised in the next slide.

Possible timetable for the implementation of a new CCM

- The previous CCM project required approximately 21 months of work before implementation. The key processes and timescales are as follows:
  1. Requirements Gathering (4 months) – Industry discussions on scope of CCM
  2. Selection of Service Provider and establish Industry Stakeholder Group (5 months) – includes contract development and engagement with selected service provider
  3. Creation and validation of CCM and associated datasets (12 months)

- Output datasets for the new CCM would need to be delivered by 30th Sep 2019.
- Implementation of a new CCM and Seasonal Normal in **Oct 2020** (for gas year 2020/21) would mean Step 1 would need to commence by Dec 2017.
- Analysis and decision on the suitability of current CCM to be made by DESC meeting Nov ’17.

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