Demand Estimation Sub Committee

NDM Algorithm Performance (Gas Year 2017/18)
Strand 1 Analysis – Weather Analysis

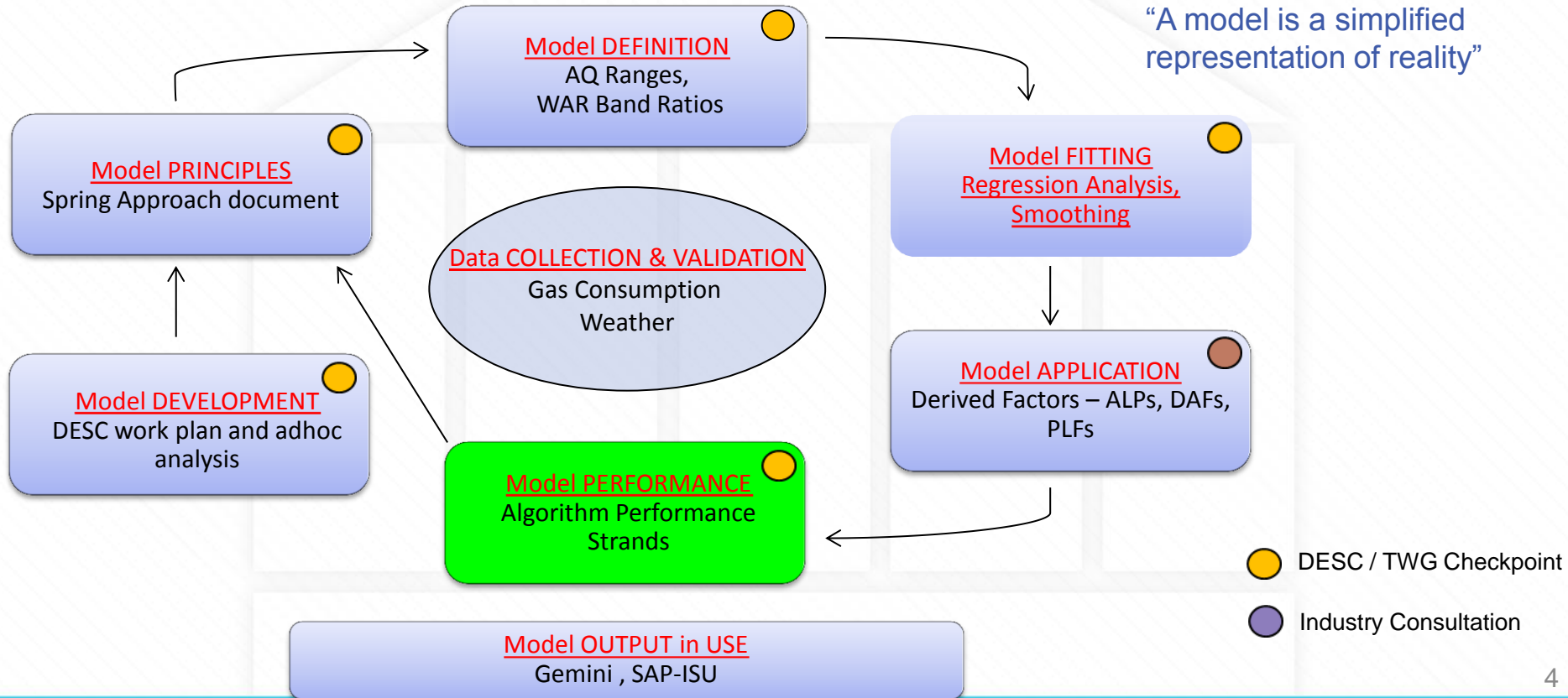10th December 2018

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, 2 & 3 (analysis of Strand 4 to be considered at February'19 DESC)

- Supporting document containing full examples and commentary for each strand to be published by end of year

Overview: EUC & Demand Model Lifecycle

The purpose of the EUC Demand Model is to represent the behaviour and reactions of the EUC Population

"A model is a simplified representation of reality"

Model DEFINITION
AQ Ranges,
WAR Band Ratios

Model PRINCIPLES
Spring Approach document

Model FITTING
Regression Analysis,
Smoothing

Data COLLECTION & VALIDATION
Gas Consumption
Weather

Model DEVELOPMENT
DESC work plan and adhoc analysis

Model APPLICATION
Derived Factors – ALPs, DAFs, PLFs

Model PERFORMANCE
Algorithm Performance
Strands

Model OUTPUT in USE
Gemini , SAP-ISU

DESC / TWG Checkpoint

Industry Consultation

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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

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 2017/18
- 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
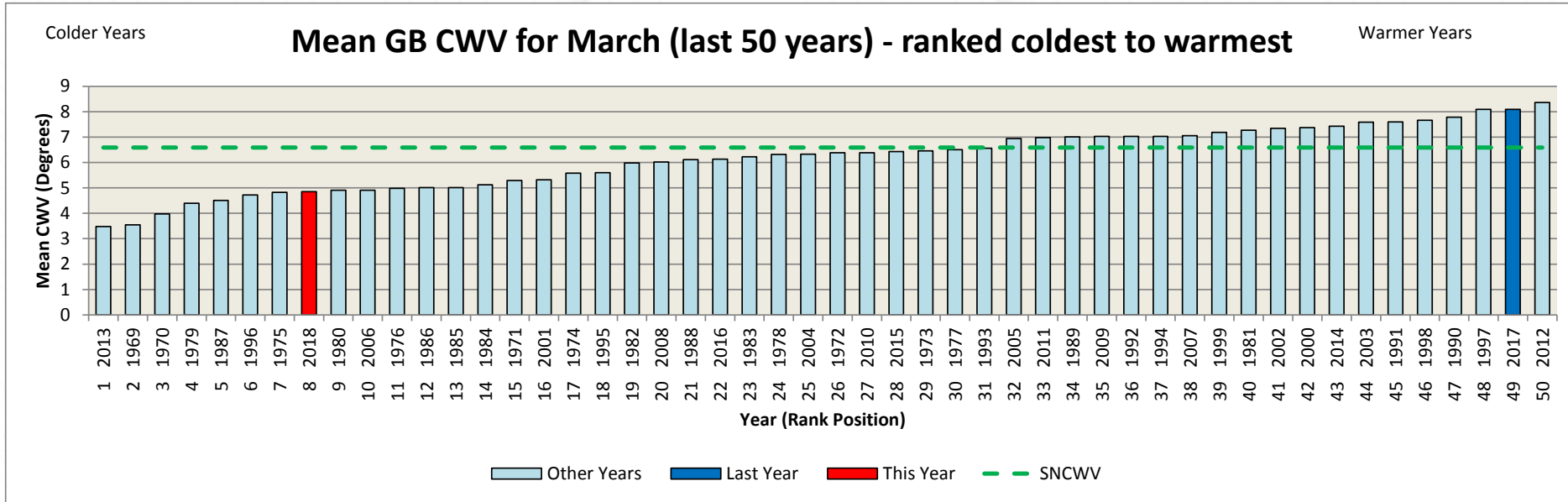
Strand 1 – Weather Analysis: Daily Observations

GB WCF (CWV Deviation from SNCWV)
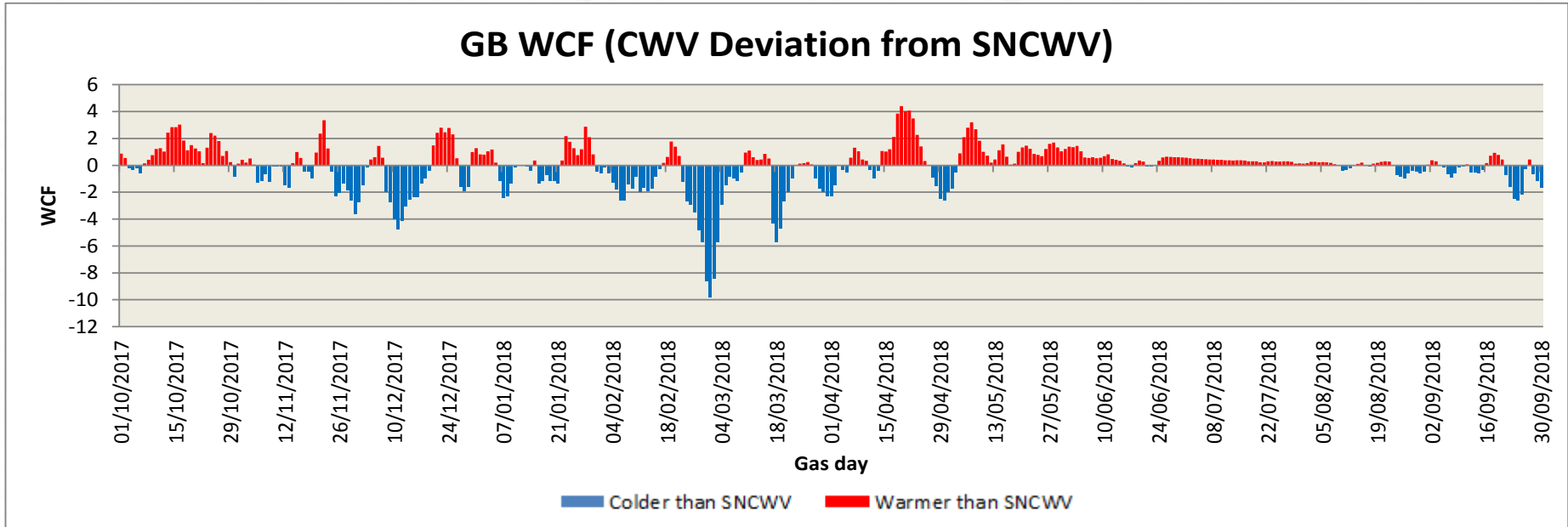
- Chart shows daily comparisons of CWV vs SNCWV throughout Gas Year 2017/18
- February and March 2018 were mostly colder than normal (particularly colder end Feb/ start March)
- Table shows min and max deviation of CWV from SNCWV by month

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Max	+3.03	+3.36	+2.79	+2.88	+1.77	+1.09	+4.4	+3.2	+1.44	+0.56	+0.3	+0.93
Min	-0.82	-3.65	-4.75	-2.40	-8.63	-9.82	-2.65	-1.95	-0.12	0.13	-1.01	-2.64

Strand 1 – Weather Analysis: Monthly Assessment

Mean GB CWV for March (last 50 years) - ranked coldest to warmest

Colder Years

Warmer Years

- Chart shows national monthly CWV assessment over past 50 years for March
- March 2018 was much colder than the current seasonal normal overall
- Majority of individual days were colder than normal (incl. several days of snow)
- Ranked as 8th coldest March over the past 50 years

Strand 1 – Weather Analysis: Monthly Assessment

Mean GB CWV for April (last 50 years) - ranked coldest to warmest

Colder Years — Warmer Years
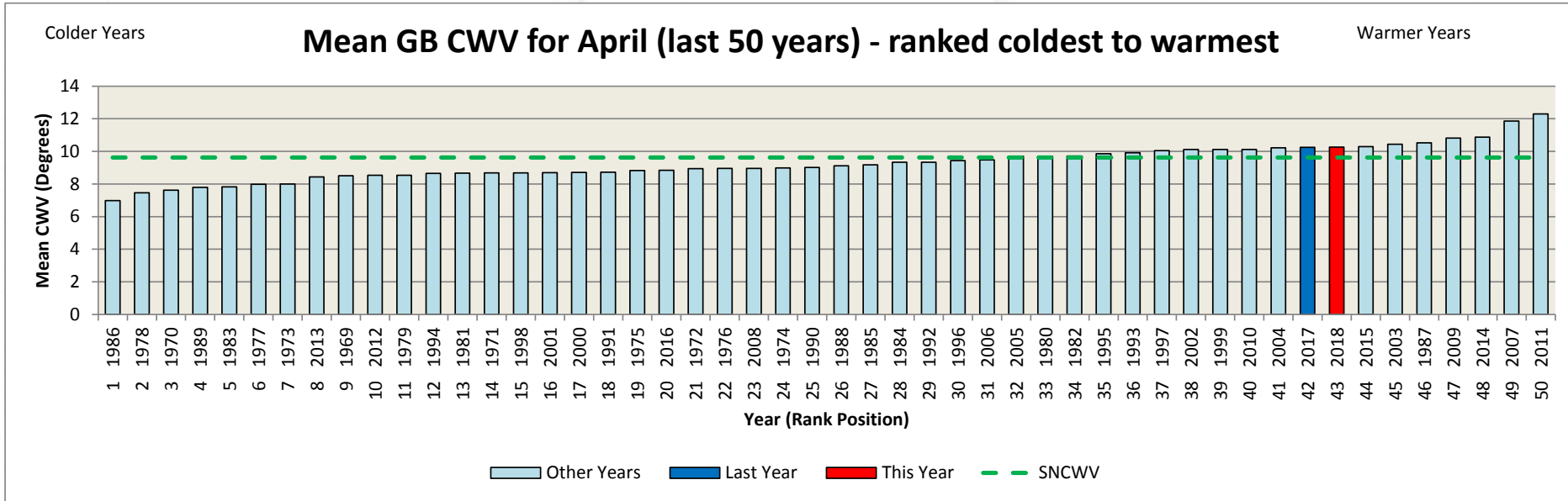
- Chart shows national monthly CWV assessment over past 50 years for April
- April 2018 was much warmer than the current seasonal normal overall
- Majority of individual days were warmer than normal
- Ranked as 8th warmest April over the past 50 years

Strand 1 – Weather Analysis: Confidence Intervals Analysis

- Confidence Interval analysis has been performed on observed WCF values during Gas Year 2017/18

- 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
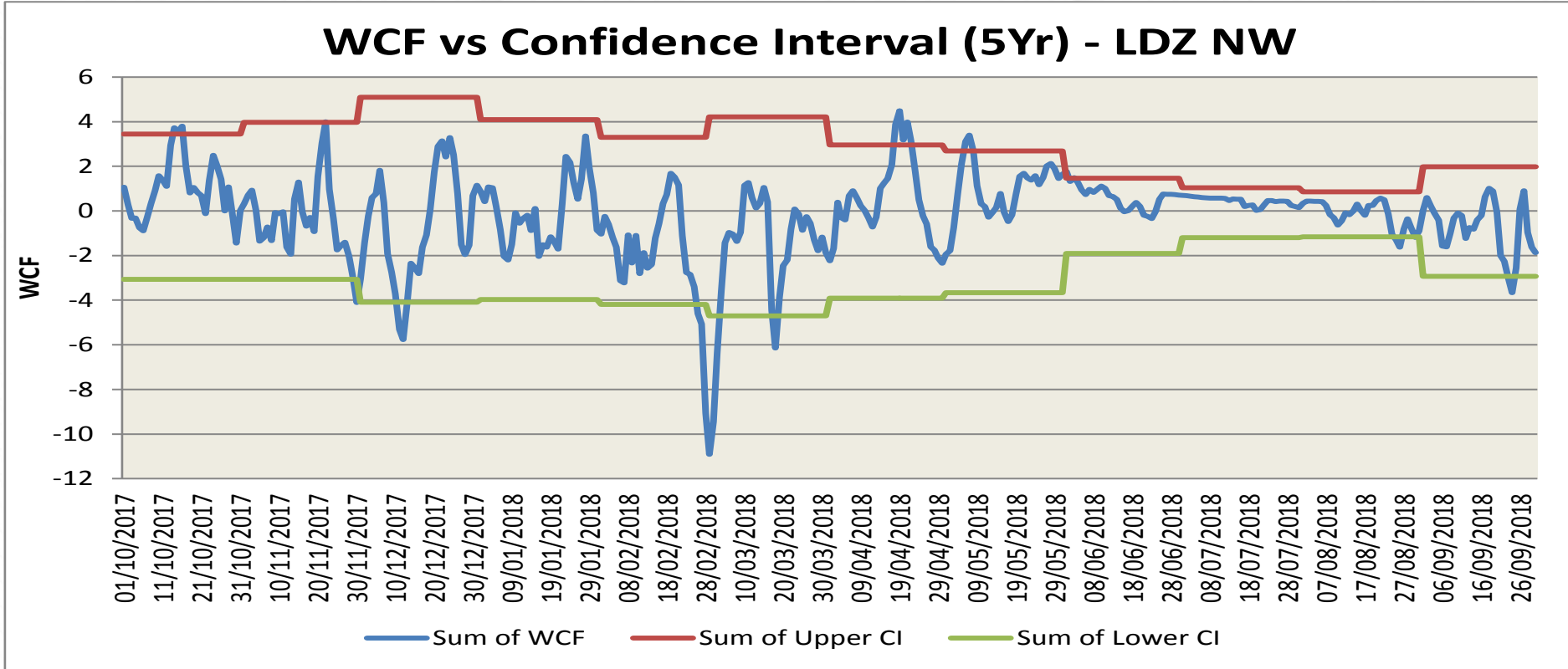
Strand 1 – Weather Analysis: Confidence Intervals Analysis

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

WCF vs Confidence Interval (5Yr) – LDZ WS
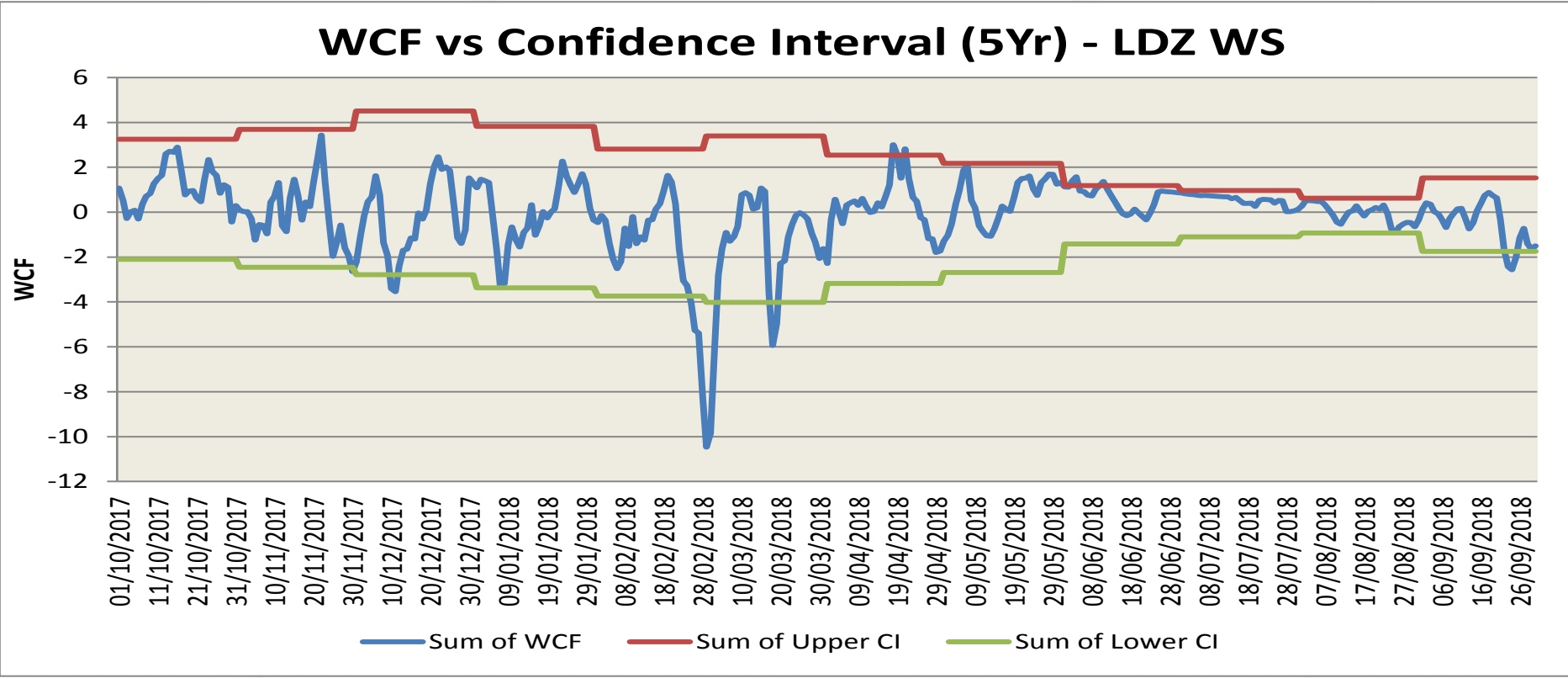
Strand 1 – Weather Analysis: Confidence Intervals Analysis

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

WCF vs Confidence Interval (5Yr) - LDZ NW

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'17	100%	97%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Nov'17	100%	97%	93%	93%	93%	97%	97%	97%	97%	97%	97%	100%
Dec'17	90%	94%	90%	90%	90%	90%	94%	97%	97%	97%	97%	94%
Jan'18	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Feb'18	93%	93%	89%	89%	89%	89%	86%	89%	89%	89%	89%	89%
Mar'18	84%	84%	87%	81%	81%	87%	84%	84%	84%	84%	84%	84%
Apr'18	83%	83%	83%	83%	83%	83%	93%	83%	83%	83%	87%	87%
May'18	100%	87%	94%	90%	90%	90%	100%	94%	94%	94%	90%	94%
Jun'18	90%	90%	93%	97%	90%	87%	90%	97%	93%	93%	97%	87%
Jul'18	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Aug'18	97%	94%	90%	97%	97%	100%	100%	100%	100%	97%	100%	100%
Sep'18	97%	93%	93%	100%	97%	97%	90%	90%	90%	90%	87%	90%

Strand 1 – Weather Analysis: Conclusions

- Overall, the observed weather during Gas Year 2017/18 when compared to current seasonal normal is as follows:
    - Quarter 1 (Oct'17 to Dec'17) was generally warmer
    - Quarter 2 (Jan'18 to Mar'18) was generally colder
    - Quarter 3 (Apr'18 to Jun'18) was generally warmer
    - Quarter 4 (Jul'18 to Sep'18) was generally warmer
- The stand out periods of unusual weather were:
    - April'18 – 8th warmest April in 50 yrs with a notable 5 day warmer period of 18th to 22nd
    - July'18 – all days in the month were warmer than normal
    - Top 5 colder than normal days: 1st Mar'18; 28th Feb'18; 2nd Mar'18; 3rd Mar'18 and 18th Mar'18
    - Top 5 warmer than normal days: 19th Apr'18; 21st Apr'18; 20th Apr'18; 18th Apr'18 and 22nd Apr'18

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