Initial benchmark results of CWV calculation

Review of the CWV formula

I have agreed to:

- perform review of existing formula and provide benchmarking figures
- prepare analysis around new formula options utilising additional weather data
- produce optimised values for each LDZ for final formula that DESC agree upon

The aim today is to share initial results for 3 LDZs (EA, NE, NT) and how the analysis was produced.

Gather feedback then produce the results for all LDZs.

Expected Approach

- Provide more visibility on the method of CWV optimisation.
- Produce analysis following a structured approached. Firstly, producing results on the latest optimisation of the current CWV definition – the benchmark results, against which improvements are measured.
- Sharing the analysis tool, so any cross collaboration is like for like, against the benchmark results. Therefore Excel has been chosen as the analysis tool.

Review of CWV Optimisation Tool

- CWV optimisation is a complicated exercise.
- The tool has been shared with Xoserve to “audit” for accuracy and correct understanding of the approach.
- Refinements have been made along the way.

Initial Approach

- Gas years chosen 2010 to 2017. Includes cold winter in 2010, summer 2018. Focused upon recent years, consistent with approach previously used.
- NDM measurements provided by Xoserve, excluding Bad days.
- Options allow to exclude a years inputs into the SNET or CWV parameters. All years have been included.
- Further details noted in “General Steps for CWV Optimisation.pdf”

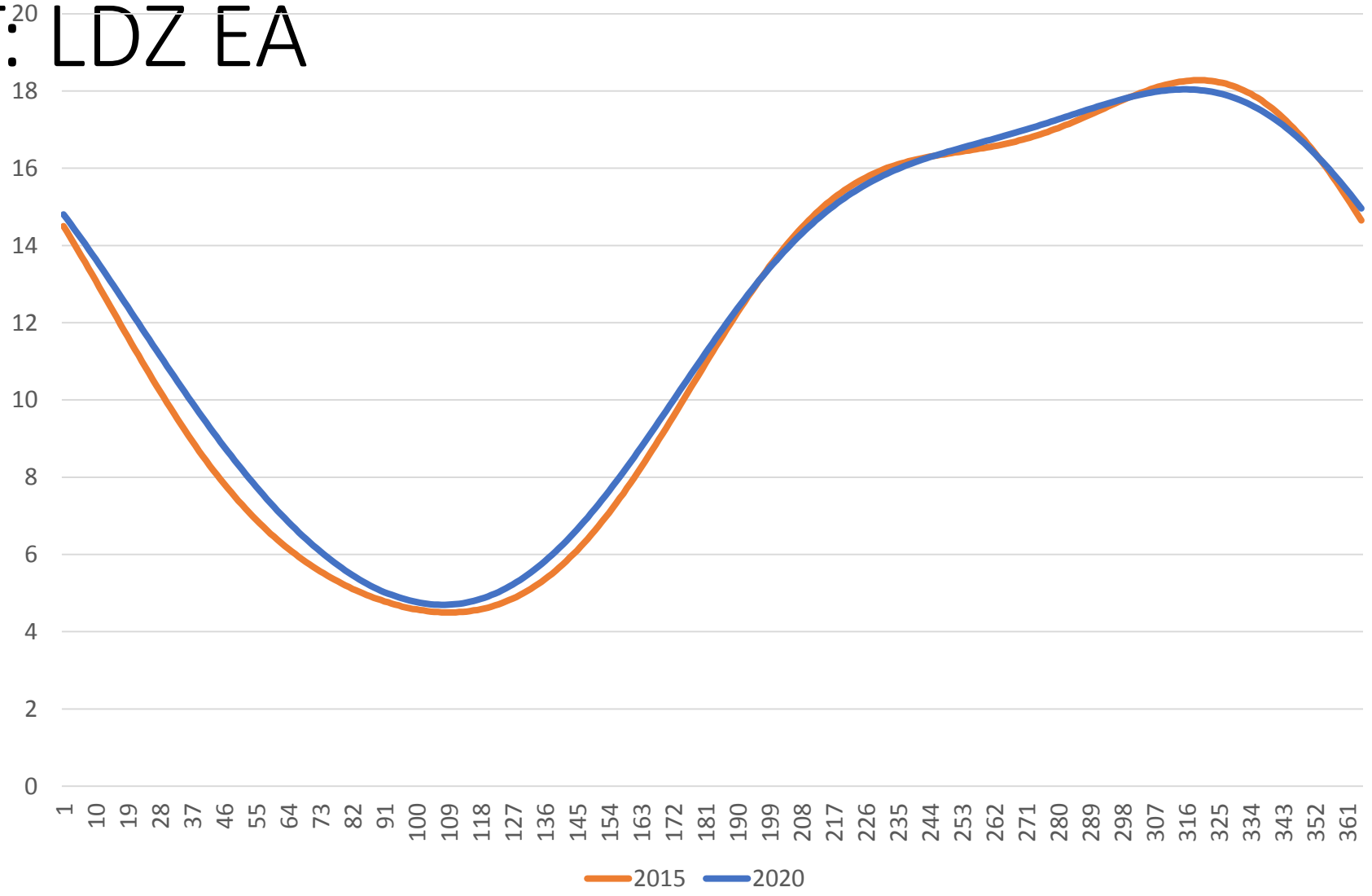
Parameter Interpretations

Parameter	Comments
Effective Temperature/AT Weight (ET calculation)	Determines the combination of AT/ET used
Effective Temperature Weight (I1)	What proportion of CWV is ET Term (0.7) & SNET (0.3)
Wind Chill Weight (I2)	Rule of thumb each -0.01 reduces CWV by 0.1 (AT=0, WS=10)
Cold Weather Sensitivity (I3)	A greater cold weather effect is applied..
Cold Weather Upturn Threshold (V0)	….below this threshold
Lower Warm Weather Cut-Off (V1)	Attempts to model a lower demand response as temperature increase. These in combination determines Max CWV
Upper Warm Weather Cut-Off (V2)	
Slope Relating to Warm Weather Cut-Off (q)	
Wind Chill Wind Cut-Off (W0)	Additional wind chill effect below V0
Wind Chill Temperature Cut-Off (T0)	Approx. temperature cut-off when wind has no influence on CWV

Results: LDZ EA

Parameter	2015	2020	Comments
Effective Temperature/AT Weight	0.500	0.456	more weighting is applied to todays AT
Effective Temperature Weight (I1)	0.719	0.723	
Wind Chill Weight (I2)	0.014	0.012	
Cold Weather Sensitivity (I3)	0.090	0.255	A greater cold weather effect is applied..
Cold Weather Upturn Threshold (V0)	3.000	2.060	below 2.06c
Lower Warm Weather Cut-Off (V1)	15.300	15.021	Max CWV little changed 16.66 v 16.62
Upper Warm Weather Cut-Off (V2)	19.200	19.054	
Slope Relating to Warm Weather Cut-Off (q)	0.340	0.407	
Wind Chill Wind Cut-Off (W0)	0.000	-0.366	
Wind Chill Temperature Cut-Off (T0)	14.000	14.375	
R2	**0.9910**	**0.9911**	**Small improvement within typical range**

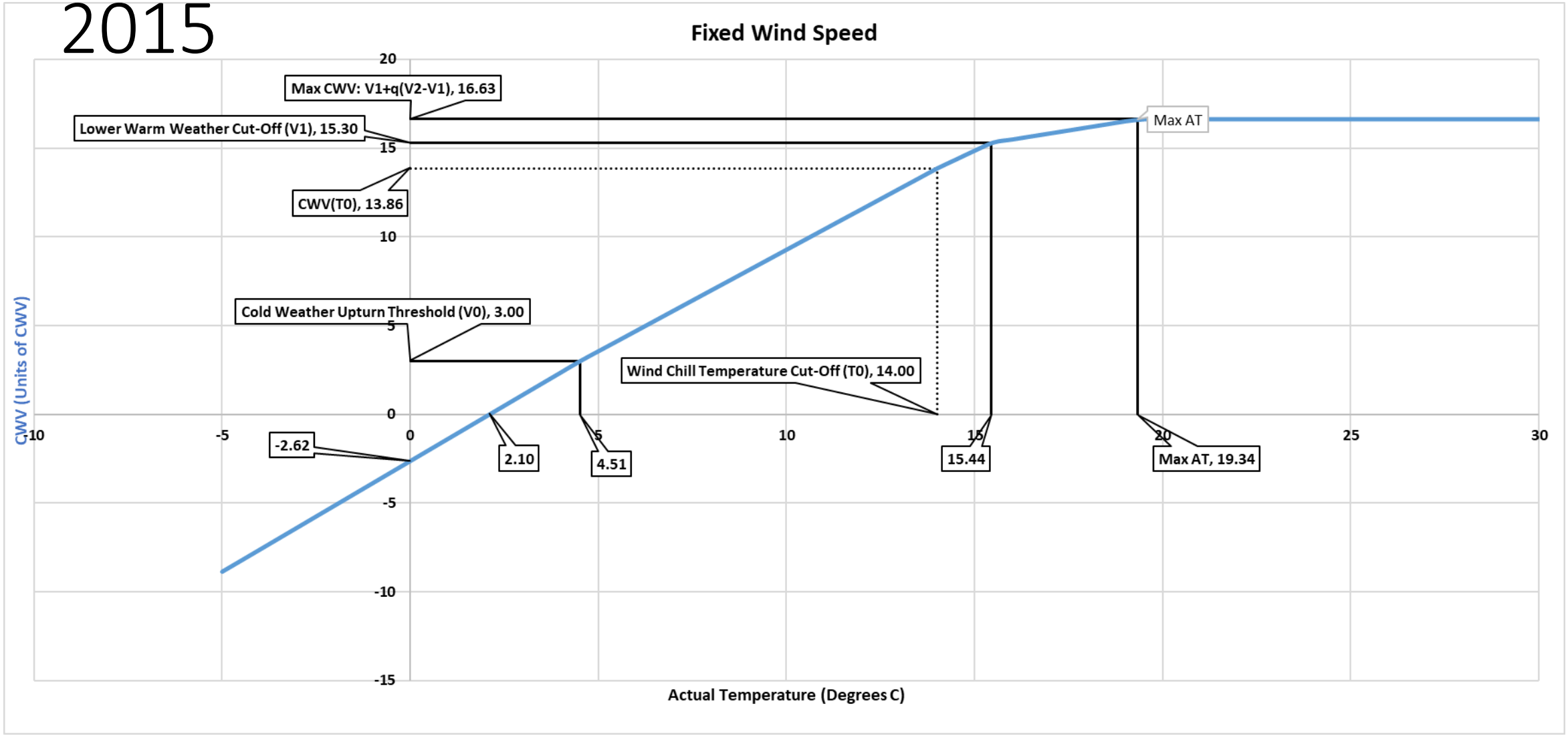
SNET: LDZ EA



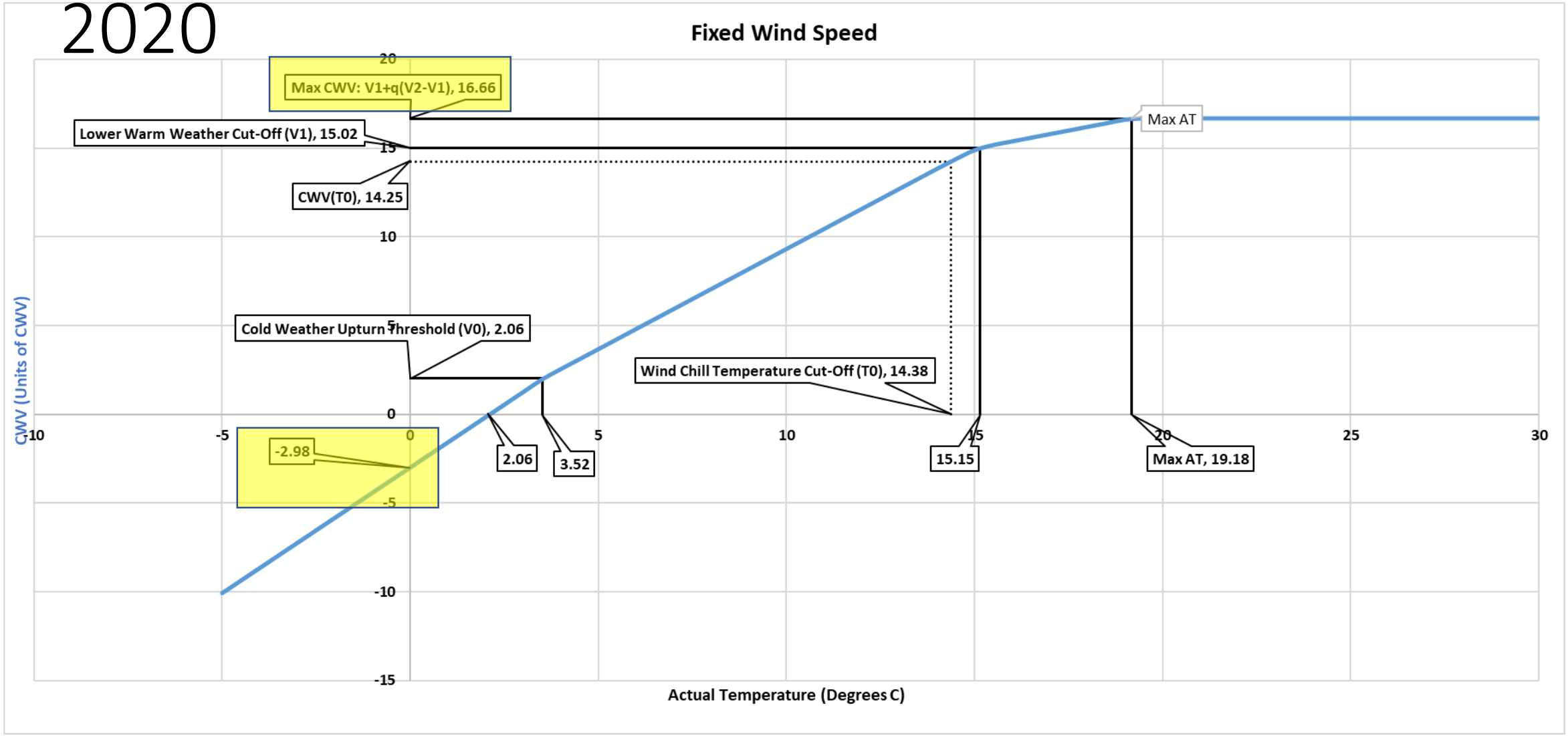
Jason Blackmore. Initial Benchmark Results of CWV Calculation.

More info see: CWV - Temp and Wind Speed Analysis.pdf

2015



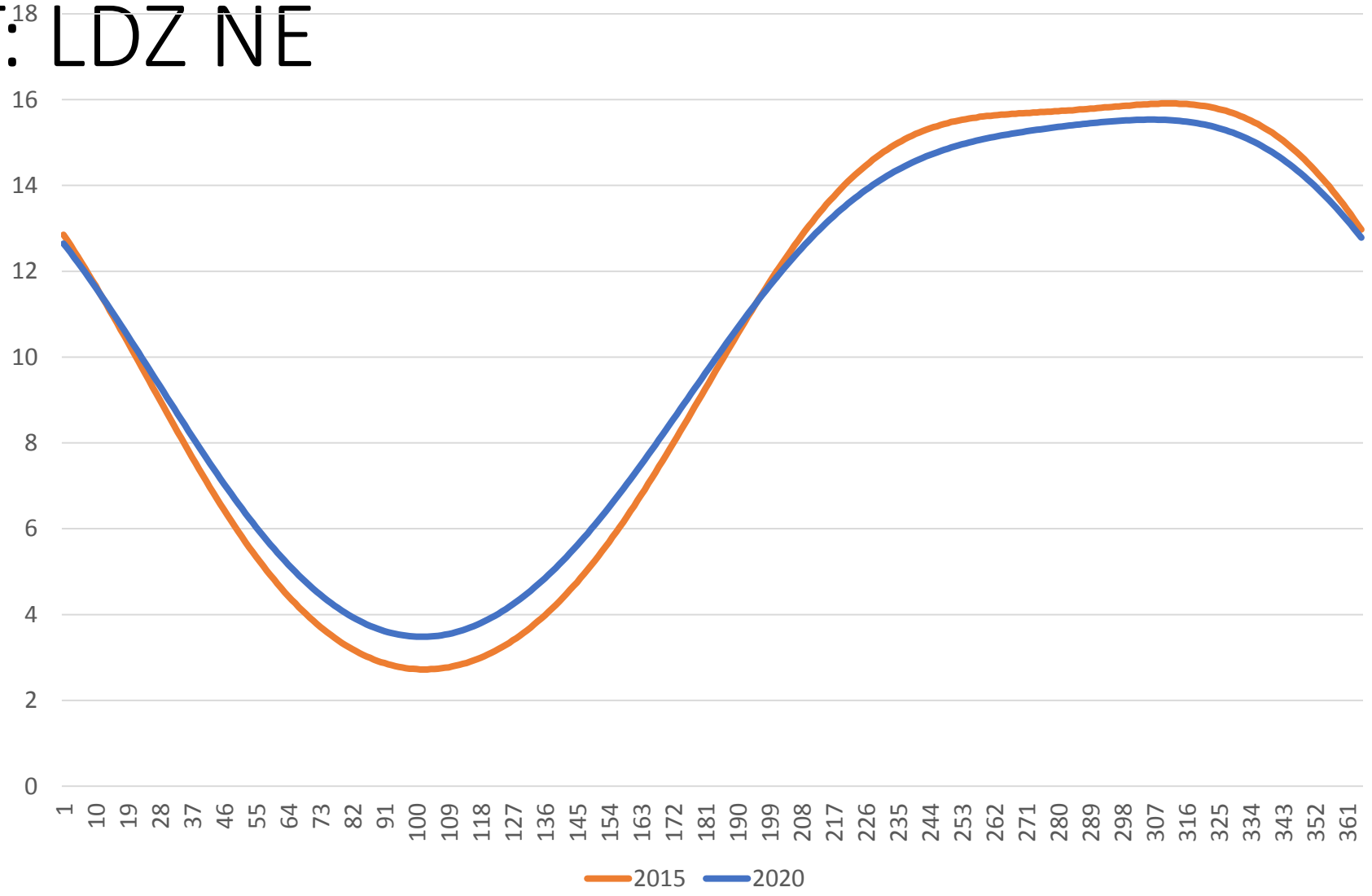
2020


Fixed Wind Speed
Max CWV: V1+q(V2-V1), 16.66
Lower Warm Weather Cut-Off (V1), 15.02
CWV(T0), 14.25
Cold Weather Upturn Threshold (V0), 2.06
Wind Chill Temperature Cut-Off (T0), 14.38
Max AT
-2.98
2.06
3.52
15.15
Max AT, 19.18
CWV (Units of CWV)
Actual Temperature (Degrees C)
20
15
10
5
0
-5
-10
-15
-10
-5
0
5
10
15
20
25
30

Results: LDZ NE

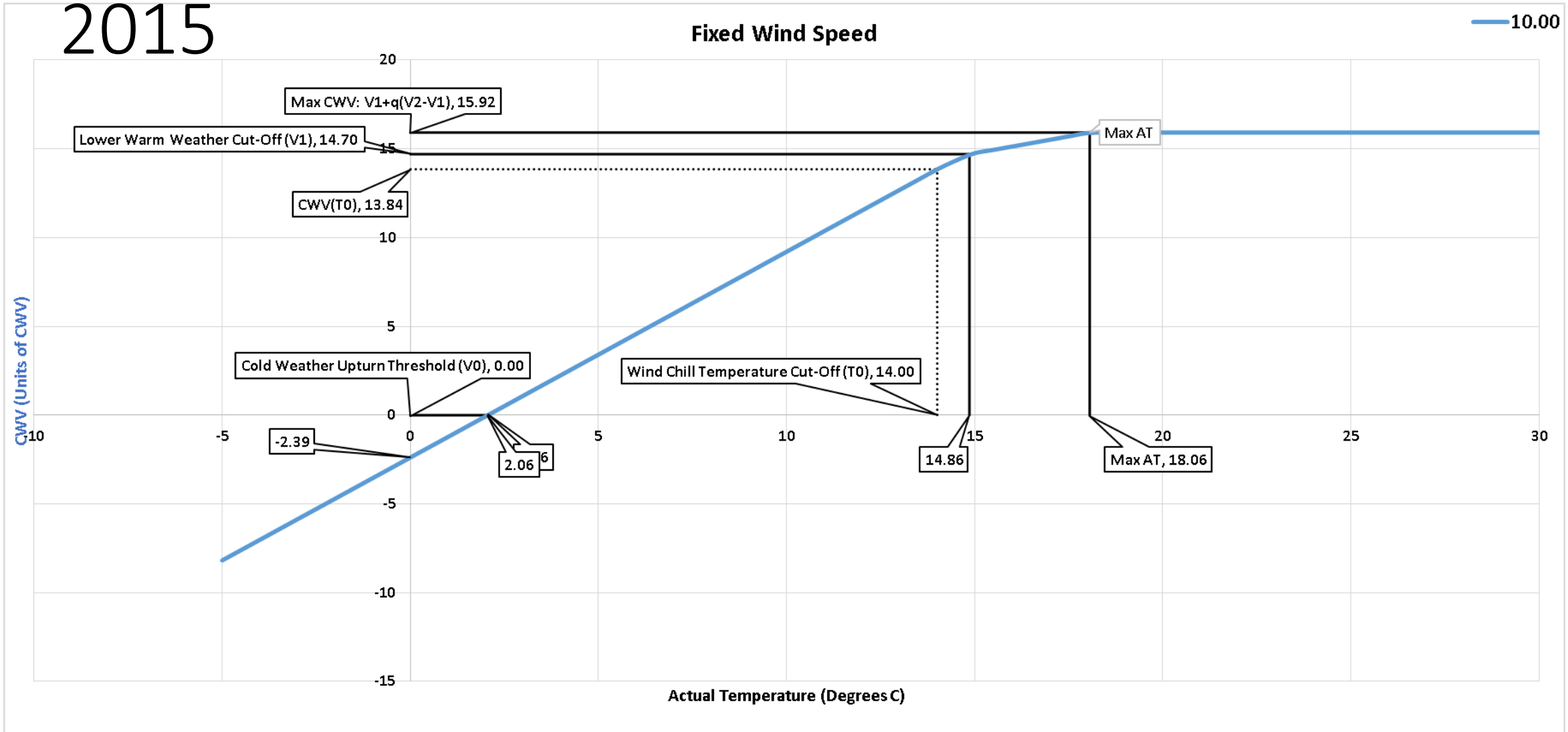
Parameter	2015	2020	Comments
Effective Temperature/AT Weight	0.500	0.472	more weighting is applied to todays AT
Effective Temperature Weight (I1)	0.676	0.647	
Wind Chill Weight (I2)	0.016	0.018	
Cold Weather Sensitivity (I3)	0.000	0.063	If AT = 0 & Wind =10, CWV = -2.84 v -2.39
Cold Weather Upturn Threshold (V0)	0.000	0.177	
Lower Warm Weather Cut-Off (V1)	14.700	13.838	Max CWV changed 15.49 v 15.92
Upper Warm Weather Cut-Off (V2)	17.900	17.334	
Slope Relating to Warm Weather Cut-Off (q)	0.380	0.471	
Wind Chill Wind Cut-Off (W0)	0.000	0.847	
Wind Chill Temperature Cut-Off (T0)	14.000	14.829	
R2	**0.9862**	**0.9864**	**Small improvement within typical range**

SNET: LDZ NE

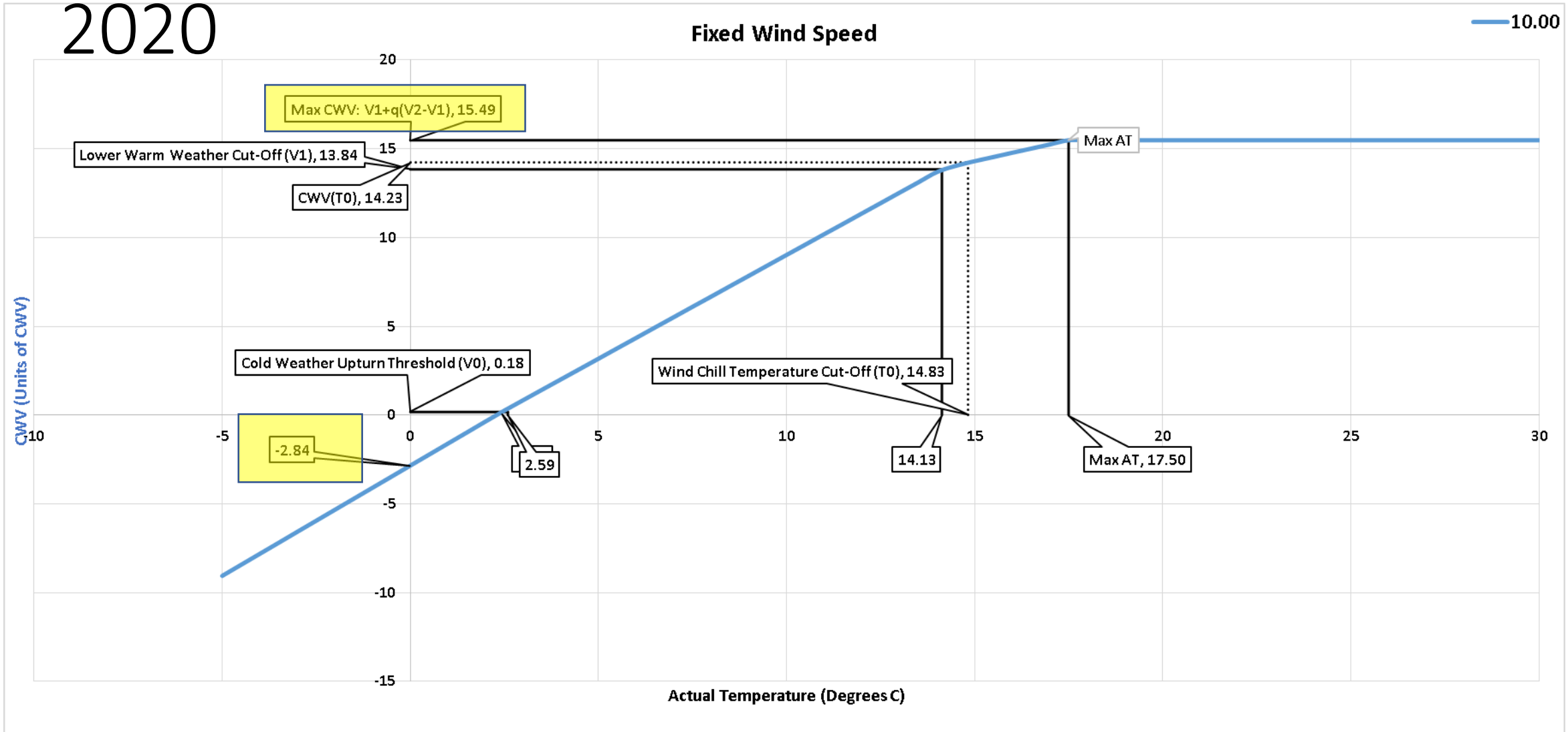


Jason Blackmore. Initial Benchmark Results of CWV Calculation.

2015


Fixed Wind Speed
10.00
Max CWV: V1+q(V2-V1), 15.92
Lower Warm Weather Cut-Off (V1), 14.70
CWV(T0), 13.84
Max AT
Cold Weather Upturn Threshold (V0), 0.00
Wind Chill Temperature Cut-Off (T0), 14.00
-2.39
2.06
14.86
Max AT, 18.06
CWV (Units of CWV)
Actual Temperature (Degrees C)
20
15
10
5
0
-5
-10
-15
-10
-5
0
5
10
15
20
25
30

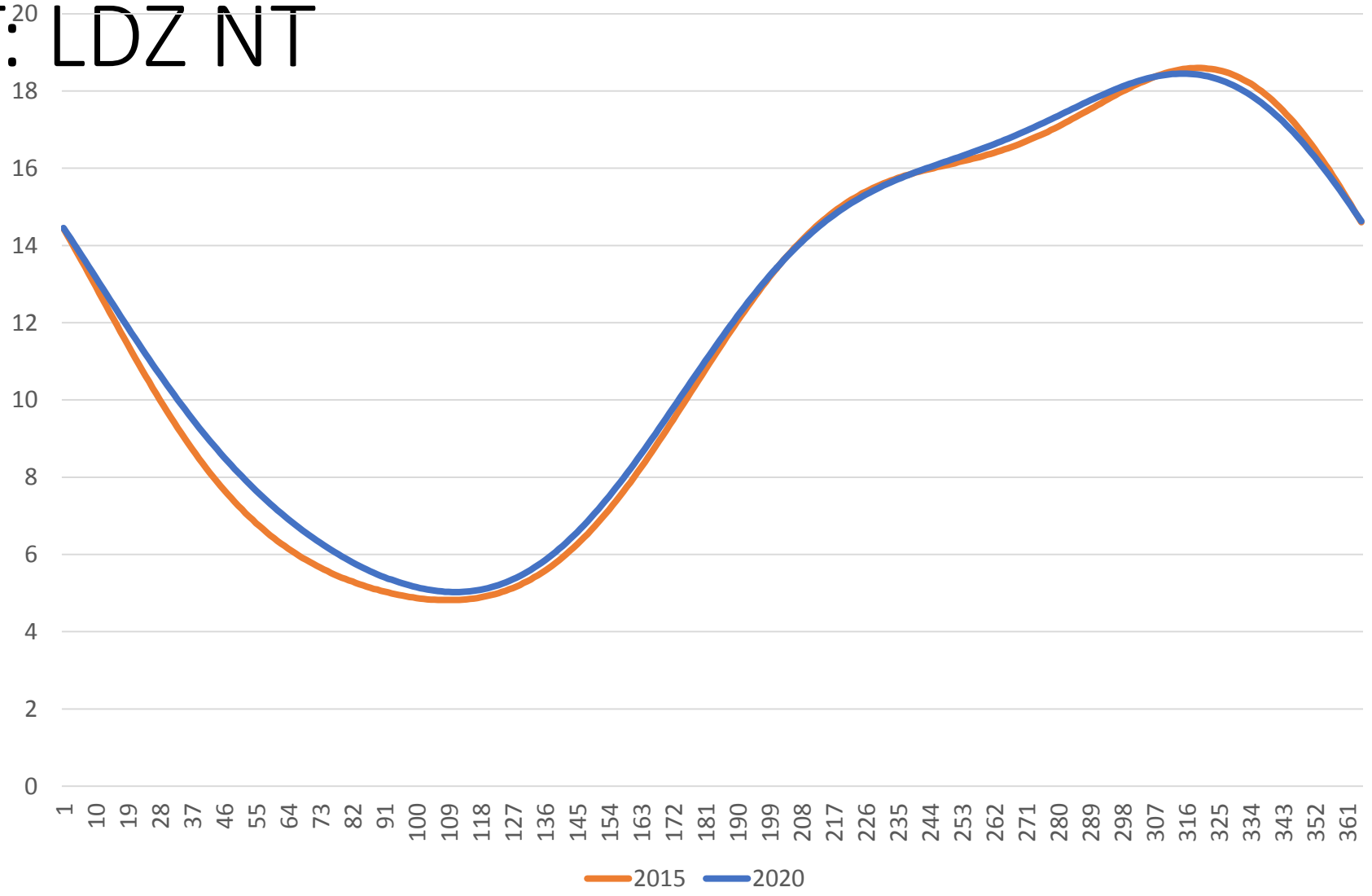
2020


Fixed Wind Speed
10.00
Max CWV: V1+q(V2-V1), 15.49
Lower Warm Weather Cut-Off (V1), 13.84
CWV(T0), 14.23
Max AT
Cold Weather Upturn Threshold (V0), 0.18
Wind Chill Temperature Cut-Off (T0), 14.83
-2.84
2.59
14.13
Max AT, 17.50
CWV (Units of CWV)
Actual Temperature (Degrees C)
20
15
10
5
0
-5
-10
-15
-10
-5
0
5
10
15
20
25
30

Results: LDZ NT

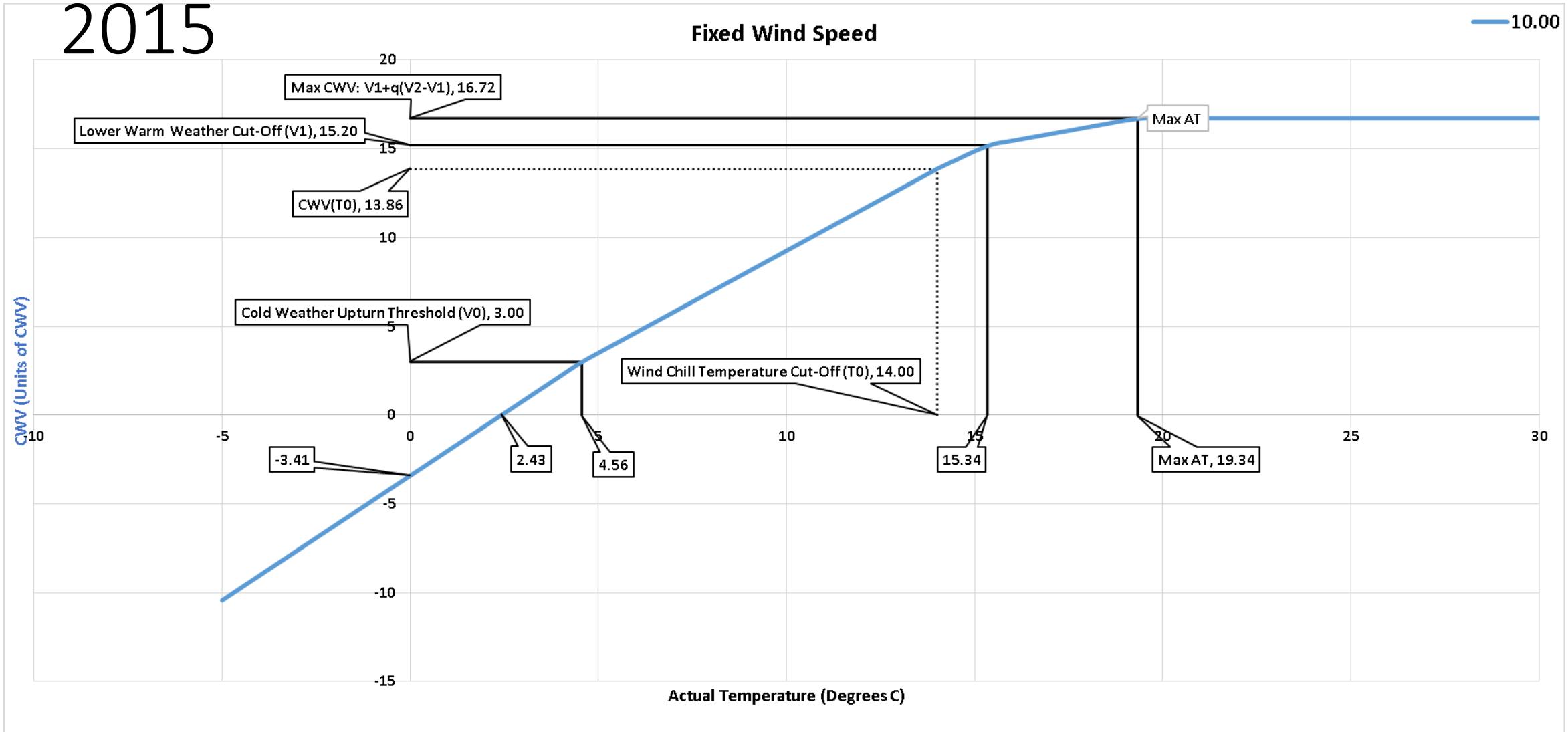
Parameter	2015	2020	Comments
Effective Temperature/AT Weight	0.500	0.484	more weighting is applied to todays AT
Effective Temperature Weight (I1)	0.727	0.738	
Wind Chill Weight (I2)	0.015	0.014	
Cold Weather Sensitivity (I3)	0.220	0.293	If AT = 0 & Wind =10, CWV = -3.41 v -3.99
Cold Weather Upturn Threshold (V0)	3.000	2.520	
Lower Warm Weather Cut-Off (V1)	15.200	14.687	Max CWV changed 16.78 v 16.72
Upper Warm Weather Cut-Off (V2)	19.200	19.419	
Slope Relating to Warm Weather Cut-Off (q)	0.380	0.442	
Wind Chill Wind Cut-Off (W0)	0.000	-1.650	
Wind Chill Temperature Cut-Off (T0)	14.000	14.263	
R2	**0.9928**	**0.9929**	**Small improvement within typical range**

SNET: LDZ NT

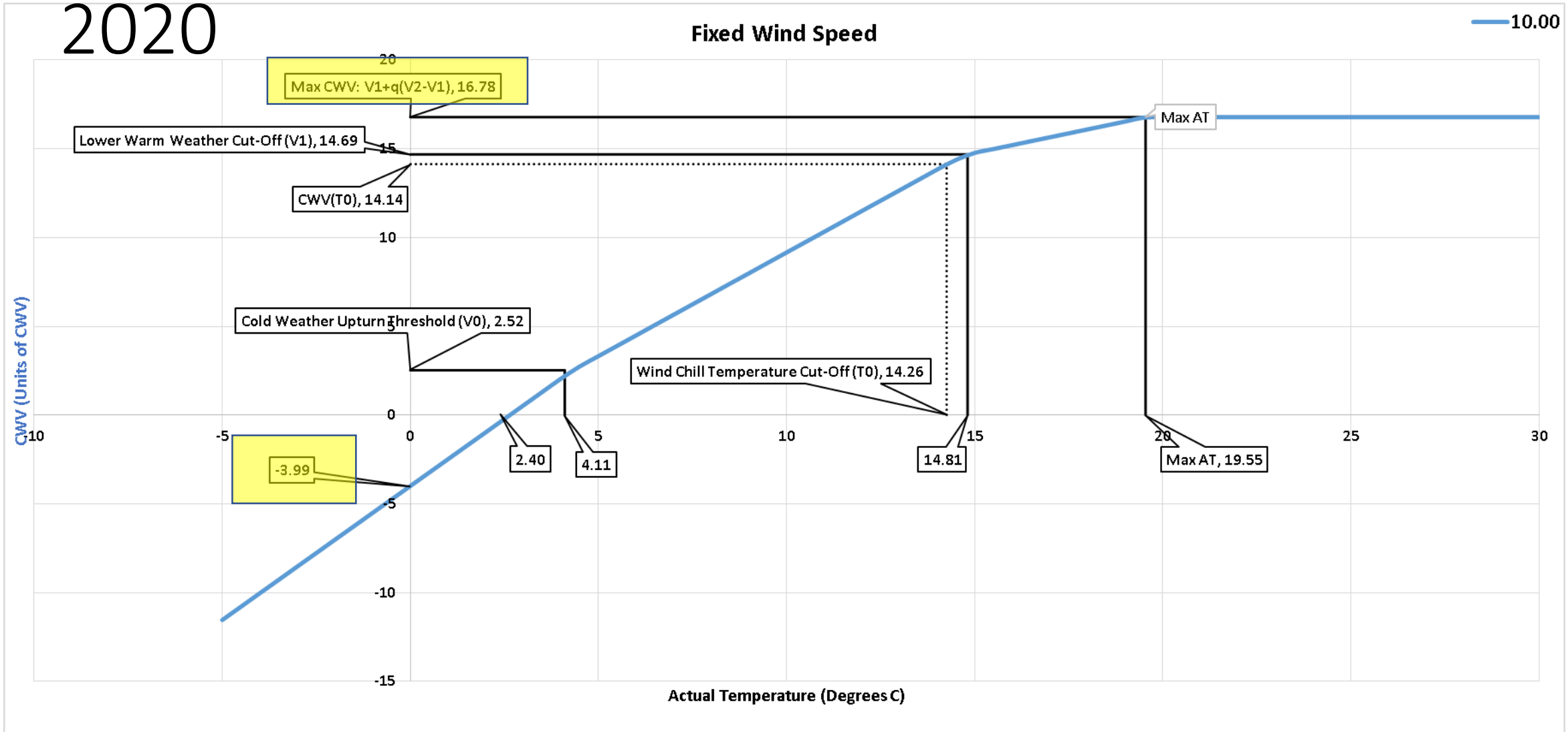


Jason Blackmore. Initial Benchmark Results of CWV Calculation.

2015


Fixed Wind Speed
10.00
Max CWV: V1+q(V2-V1), 16.72
Lower Warm Weather Cut-Off (V1), 15.20
CWV(T0), 13.86
Cold Weather Upturn Threshold (V0), 3.00
Wind Chill Temperature Cut-Off (T0), 14.00
Max AT
-3.41
2.43
4.56
15.34
Max AT, 19.34
CWV (Units of CWV)
Actual Temperature (Degrees C)
20
15
10
5
0
-5
-10
-15
-10
-5
0
5
10
15
20
25
30

2020


Fixed Wind Speed
10.00
Max CWV: V1+q(V2-V1), 16.78
Lower Warm Weather Cut-Off (V1), 14.69
CWV(T0), 14.14
Cold Weather Upturn Threshold (V0), 2.52
Wind Chill Temperature Cut-Off (T0), 14.26
Max AT
-3.99
2.40
4.11
14.81
Max AT, 19.55
CWV (Units of CWV)
Actual Temperature (Degrees C)
20
15
10
5
0
-5
-10
-15
-10
-5
0
5
10
15
20
25
30

Summary of Results

- No significant changes which appears to be consistent with prior updates

2015	EA	NE	NT
R2	0.9910	0.9862	0.9928

- More significance applied to todays AT in the ET calculation

2020	EA	NE	NT
R2	0.9911	0.9864	0.9929

- Cold Weather Upturn is greater

- Suggests little scope that optimising the existing CWV definition will reduce UIG

Next Steps

Continue with producing a series of benchmark results for the reminding LDZs

Input sought on the benchmark results to be reported

Tool will be amended to report on these benchmark results

Continue more in-depth improvements to the CWV