Final benchmark results of CWV calculation

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Approach

- Gas years used for deriving parameters are 2010/11 to 2017/18

- For these gas years the demand data used in CWV optimisation process is:
  - Aggregate NDM demand for LDZ. Note: All available Mon. to Thurs. non holiday demand data points used in analysis (bad NDM measurements excluded)
- For these gas years the weather data used in CWV optimisation process is:
  - Weather data from each weather station as listed in Appendix: LDZ/Weather Stations. Combination of WSSM and our weather provider history. LDZ SW is now based upon Yeovilton weather station observations.

- All gas years used to derive Pseudo SNET profile

- Temperature and Wind speed weights have been updated

2020 Weights

Weight	T_05	T_07	T_09	T_11	T_13	T_15	T_17	T_19	T_21	T_23	T_01	T_03
2015	0.0500	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.0500	0.0500	0.0500
2020	0.0388	0.1426	0.0155	0.1201	0.1364	0.1087	0.0664	0.1924	0.0697	0.091	0.0184	0.0000

Weight	W_07	W_11	W_15	W_19	W_23	W_03
2015	0.1667	0.1667	0.1667	0.1667	0.1666	0.1666
2020	0.1887	0.1284	0.1735	0.1995	0.2813	0.0286

Common Results across the LDZ so far

- CWV Optimisation plus the revised temperature and wind weights, improve model fit in 10 out of 13 LDZs.

- Winter results (MAPE, RMSE) are better, significant in most LDZs, offset by worse results for Jul & Aug. The SNET & revised weights is driving these results. In 5 out of 13 LDZs MAPE results are now better with revised weights.

Common Results across the LDZ so far

- Shoulder months (Mar/Apr/May/Sep/Oct) are much better in many LDZs and overall.

- Jul and August worse.

MAPE

All LDZ	Simple average of LDZ results								All Years
	2010	2011	2012	2013	2014	2015	2016	2017	
Jan	0.06%	0.10%	0.32%	0.08%	-0.09%	0.20%	-0.23%	0.11%	0.07%
Feb	0.22%	0.02%	0.07%	-0.04%	-0.21%	0.08%	-0.22%	0.10%	0.00%
Mar	-0.36%	-0.93%	-0.29%	-0.28%	-0.03%	-0.05%	-0.17%	-0.06%	-0.27%
Apr	-1.34%	-0.53%	0.00%	-0.31%	-1.51%	-0.28%	-0.71%	-0.06%	-0.59%
May	-0.15%	0.06%	-0.79%	0.20%	0.06%	-0.55%	-0.85%	0.06%	-0.24%
Jun	-0.89%	-0.38%	0.81%	0.57%	-0.16%	1.09%	0.60%	2.22%	0.48%
Jul	0.79%	0.40%	2.89%	1.93%	0.74%	1.92%	1.52%	2.57%	1.59%
Aug	0.95%	1.00%	3.19%	1.37%	0.11%	1.56%	1.03%	1.58%	1.35%
Sep	-1.11%	1.10%	-0.10%	0.07%	-1.20%	1.52%	-0.89%	-0.57%	-0.15%
Oct	0.25%	-1.31%	0.48%	0.60%	-0.26%	-1.13%	-1.44%	0.08%	-0.34%
Nov	0.63%	-0.57%	-0.12%	-0.07%	-0.71%	0.64%	0.17%	-0.22%	-0.03%
Dec	0.25%	0.27%	-0.11%	0.21%	0.05%	0.26%	0.04%	-0.05%	0.11%
All Months	-0.06%	-0.06%	0.53%	0.36%	-0.27%	0.44%	-0.10%	0.48%	**0.16%**

R2 Summary

LDZ	2015	2020	2020 (New Weights)	
EA	0.9910	0.9909	0.9913	BETTER
EM	0.9916	0.9915	0.9919	
NE	0.9862	0.9862	0.9867	
NO	0.9855	0.9844	0.9860	
NT	0.9928	0.9928	0.9931	
NW	0.9884	0.9878	0.9883	SIMULAR
SC	0.9887	0.9886	0.9890	
SE	0.9914	0.9915	0.9916	
SO	0.9916	0.9908	0.9909	WORSE
SW	0.9902	0.9877	0.9890	
WM	0.9918	0.9922	0.9926	
WN	0.9835	0.9843	0.9846	
WS	0.9825	0.9829	0.9835	

MAPE Summary

LDZ	2015	2020	2020 (New Weights)	
EA	5.55	6.13	5.91	WORSE
EM	6.67	6.92	6.63	BETTER
NE	6.78	7.01	6.67	
NO	7.27	7.42	7.24	
NT	4.70	4.89	4.86	
NW	6.59	6.83	6.56	
SC	5.83	6.14	5.94	
SE	5.20	5.44	5.62	
SO	5.60	6.51	6.41	
SW	5.99	6.91	6.34	
WM	6.55	7.02	6.59	
WN	7.39	7.25	7.17	
WS	8.56	8.92	8.72	

LDZ Summary: CWV Optimisation and revised weights

R2 variance from 2015

10 LDZs improve

3 LDZ worse, SW - change in weather station Yeovilton from Filton

MAPE variance from 2015

MAPE adverse variance continues to be affected by Jul/Aug results
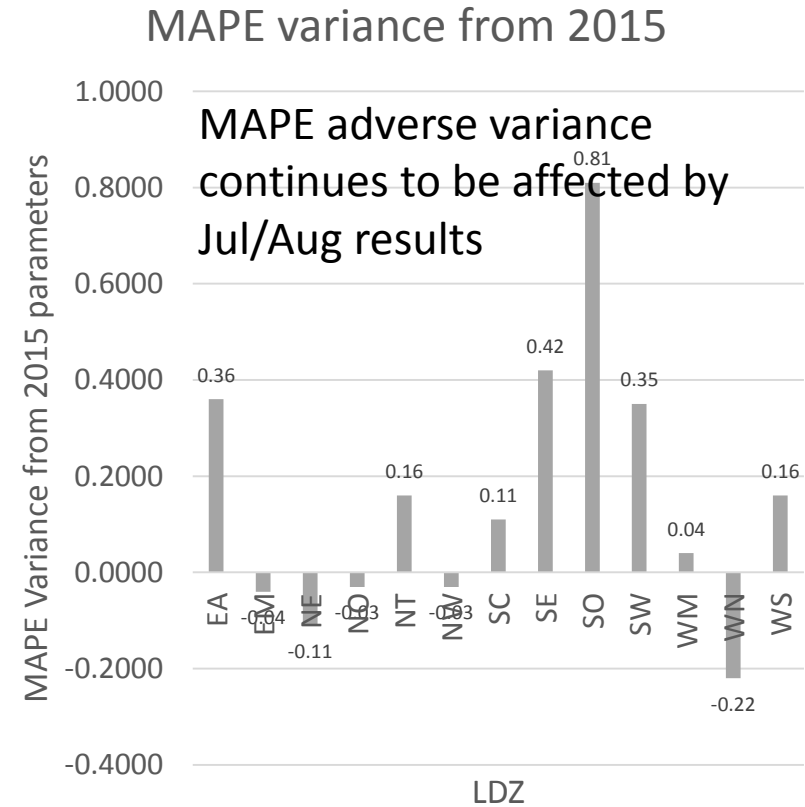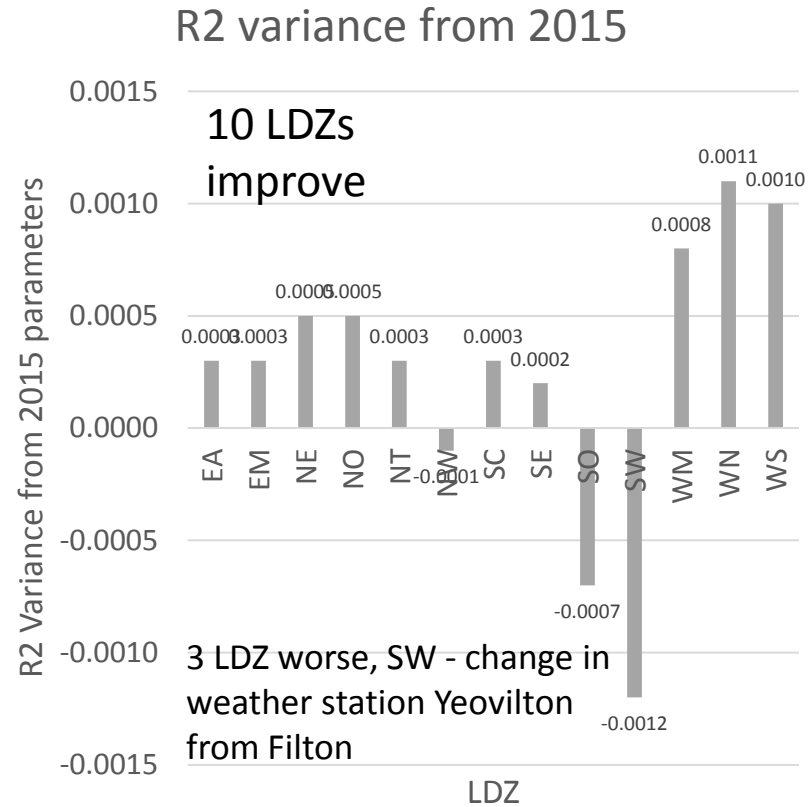
Our Recommendations

- The 2020 parameters and weights do improve upon the existing parameters, and would recommend them if there is no CWV +

Next Steps

- Against these finalise benchmark results, compare any future improvement in CWV+

- 10th July – present recommendations on CWV+ for trial LDZs.

- 8th July – confirm the form of CWV+ definition.

LDZ MAPE Variance – Optimisation plus New Weights

MAPE analysis – variance from 2020 parameters

EA — Variance from 2020 Parameters

EA	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	-0.16%	-0.10%	0.24%	0.02%	-0.15%	0.25%	-0.53%	0.26%	-0.02%
Feb	-0.21%	-0.56%	-0.01%	-0.10%	-0.07%	-0.13%	-0.41%	-0.16%	-0.21%
Mar	-1.06%	-0.35%	-0.08%	-0.31%	-0.13%	-0.06%	-0.12%	-0.13%	-0.28%
Apr	-0.42%	-0.05%	-0.44%	-0.03%	0.47%	-0.23%	-1.18%	-0.62%	-0.31%
May	3.09%	-0.25%	-1.56%	0.64%	-1.11%	-0.58%	-1.18%	0.90%	-0.01%
Jun	2.54%	0.62%	-0.44%	2.64%	0.03%	2.86%	0.15%	0.43%	1.10%
Jul	3.58%	2.49%	1.10%	0.80%	2.04%	1.27%	1.26%	0.76%	1.66%
Aug	2.30%	0.91%	0.96%	1.88%	2.60%	1.54%	1.45%	2.25%	1.74%
Sep	0.70%	1.95%	1.26%	1.02%	-0.26%	3.38%	-1.06%	0.81%	0.98%
Oct	-0.08%	-2.19%	0.74%	0.47%	-0.32%	-0.11%	-1.17%	1.32%	-0.17%
Nov	0.63%	-1.28%	-0.38%	-0.03%	-1.08%	1.02%	0.33%	-0.91%	-0.21%
Dec	-0.09%	0.15%	-0.13%	0.16%	0.11%	0.32%	0.12%	-0.07%	0.07%
All Months	0.90%	0.11%	0.11%	0.60%	0.18%	0.79%	-0.19%	0.40%	**0.36%**

EM — Variance from 2020 Parameters

EM	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	0.06%	-0.11%	0.30%	0.21%	-0.24%	0.01%	-0.39%	0.15%	0.00%
Feb	0.08%	-0.24%	-0.33%	0.18%	-0.07%	-0.01%	-0.12%	0.14%	-0.05%
Mar	-0.48%	-2.03%	0.19%	-0.43%	0.27%	-0.08%	-0.31%	0.63%	-0.28%
Apr	-1.52%	-0.59%	0.29%	-0.35%	-2.99%	-0.37%	-1.65%	0.68%	-0.81%
May	-0.82%	0.10%	-1.70%	-0.51%	-0.20%	-0.82%	-0.17%	-0.15%	-0.53%
Jun	0.62%	0.00%	0.36%	-0.23%	-1.03%	-0.98%	0.26%	1.05%	0.01%
Jul	0.77%	0.48%	-0.72%	-0.02%	-0.38%	0.29%	1.42%	-0.93%	0.11%
Aug	-1.08%	1.46%	1.36%	1.05%	-1.33%	2.20%	0.64%	0.94%	0.66%
Sep	-1.65%	0.15%	0.99%	1.02%	1.18%	3.06%	0.63%	-1.61%	0.47%
Oct	0.31%	-1.63%	0.14%	0.50%	0.01%	-0.94%	-1.30%	0.39%	-0.32%
Nov	0.40%	-0.58%	0.33%	-0.11%	-0.23%	0.29%	0.33%	-0.21%	0.03%
Dec	-0.25%	0.26%	0.23%	0.31%	0.21%	0.51%	0.14%	-0.07%	0.17%
All Months	-0.30%	-0.23%	0.12%	0.14%	-0.40%	0.26%	-0.04%	0.09%	**-0.05%**

NE — Variance from 2020 Parameters

NE	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	0.10%	-0.21%	0.36%	0.21%	-0.42%	-0.17%	-0.24%	0.02%	-0.05%
Feb	-0.34%	0.16%	-0.41%	0.09%	0.11%	0.18%	0.01%	0.33%	0.02%
Mar	0.17%	-2.88%	0.26%	-0.18%	-0.02%	0.17%	-0.29%	1.26%	-0.19%
Apr	-1.34%	-0.78%	-0.09%	-0.35%	-1.65%	-0.32%	-1.01%	-0.18%	-0.71%
May	-1.11%	-0.23%	-1.72%	-0.39%	-0.41%	-1.54%	-1.65%	0.82%	-0.78%
Jun	-1.25%	0.03%	-0.57%	0.59%	-3.21%	-1.77%	0.36%	2.50%	-0.41%
Jul	1.04%	0.44%	-0.79%	0.46%	-0.87%	0.84%	1.23%	0.42%	0.34%
Aug	0.09%	1.35%	1.93%	-0.83%	1.79%	0.90%	2.13%	0.24%	0.95%
Sep	-3.15%	1.77%	-1.33%	0.13%	-0.46%	2.89%	-0.70%	-1.88%	-0.34%
Oct	0.15%	-0.72%	0.14%	-0.03%	-0.75%	-0.51%	-1.27%	0.79%	-0.28%
Nov	0.59%	-0.32%	0.30%	0.28%	-0.13%	-0.23%	0.31%	-0.47%	0.04%
Dec	-0.57%	0.33%	0.24%	0.07%	0.23%	0.36%	0.13%	-0.24%	0.07%
All Months	-0.47%	-0.09%	-0.14%	0.00%	-0.48%	0.07%	-0.08%	0.30%	**-0.11%**

NO — Variance from 2020 Parameters

NO	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	0.02%	0.46%	-0.23%	0.15%	-0.14%	0.14%	-0.22%	0.52%	0.09%
Feb	-0.08%	-0.21%	0.00%	0.21%	0.06%	0.00%	-0.04%	0.01%	-0.01%
Mar	-0.36%	-2.56%	-0.50%	-0.55%	0.25%	-0.33%	-0.52%	-0.62%	-0.65%
Apr	-3.42%	-0.89%	-0.11%	-0.22%	-2.09%	-0.67%	-0.87%	-0.58%	-1.11%
May	-0.12%	-0.94%	-0.57%	-0.79%	0.08%	-0.18%	0.23%	-1.18%	-0.43%
Jun	-2.46%	-0.92%	0.29%	-0.66%	-0.84%	-1.25%	-0.09%	1.44%	-0.56%
Jul	0.73%	-1.25%	6.84%	1.62%	3.30%	3.93%	0.28%	2.53%	2.25%
Aug	0.14%	0.87%	3.54%	0.69%	-0.77%	1.88%	-0.03%	0.78%	0.89%
Sep	-1.93%	0.58%	-0.57%	-0.55%	-0.83%	0.28%	0.30%	-1.48%	-0.53%
Oct	1.40%	-0.14%	-1.28%	0.81%	-1.04%	-1.25%	-2.81%	0.27%	-0.50%
Nov	0.35%	-0.66%	0.11%	-0.33%	-0.99%	0.12%	-0.23%	-0.60%	-0.28%
Dec	0.48%	0.58%	0.61%	0.89%	0.27%	0.31%	0.20%	0.16%	0.44%
All Months	-0.44%	-0.42%	0.68%	0.10%	-0.23%	0.25%	-0.32%	0.10%	**-0.03%**

MAPE analysis – variance from 2020 parameters

NT

	2010	2011	2012	2013	2014	2015	2016	2017	All Years
	Variance from 2020 Parameters								
Jan	0.32%	-0.22%	0.14%	0.12%	0.16%	0.44%	-0.35%	0.21%	0.10%
Feb	0.02%	-0.37%	-0.21%	0.01%	-0.22%	0.07%	-0.28%	0.05%	-0.12%
Mar	-0.12%	-0.94%	-0.74%	-0.54%	-0.46%	-0.26%	-0.21%	-0.08%	-0.42%
Apr	-0.41%	-0.14%	-0.25%	-0.27%	-0.41%	-0.38%	-1.01%	-0.87%	-0.47%
May	1.58%	-1.16%	-1.17%	0.16%	-0.79%	-1.33%	-0.64%	-0.30%	-0.46%
Jun	0.60%	-0.82%	-1.34%	1.14%	0.33%	1.44%	0.88%	1.05%	0.41%
Jul	1.58%	-0.85%	2.11%	0.60%	0.37%	1.24%	0.74%	2.23%	1.00%
Aug	1.98%	2.57%	1.16%	1.24%	2.62%	1.28%	1.31%	2.41%	1.82%
Sep	-0.37%	1.70%	-1.21%	1.68%	-0.57%	3.14%	-1.51%	0.70%	0.44%
Oct	0.49%	-1.20%	-0.28%	0.58%	-0.67%	-0.48%	-0.14%	0.70%	-0.12%
Nov	0.37%	-1.42%	-0.87%	0.13%	-0.98%	1.35%	0.33%	-0.31%	-0.18%
Dec	0.20%	-0.18%	-0.52%	0.36%	0.10%	0.24%	-0.10%	-0.28%	-0.02%
All Months	0.52%	-0.25%	-0.26%	0.44%	-0.04%	0.56%	-0.08%	0.46%	**0.17%**

NW

	2010	2011	2012	2013	2014	2015	2016	2017	All Years
	Variance from 2020 Parameters								
Jan	0.29%	0.44%	0.90%	0.31%	-0.41%	0.38%	0.35%	0.12%	0.30%
Feb	1.85%	1.60%	1.16%	0.15%	-0.62%	-0.25%	-0.59%	0.73%	0.50%
Mar	-0.12%	-1.21%	0.65%	-0.34%	-0.42%	-0.32%	-0.70%	0.01%	-0.31%
Apr	-3.22%	-0.80%	1.73%	-1.53%	-1.87%	-0.65%	-0.58%	-0.18%	-0.89%
May	-1.07%	-0.69%	-0.06%	-0.05%	0.95%	-2.23%	-2.65%	-2.07%	-0.98%
Jun	-4.02%	0.72%	2.78%	0.08%	-1.51%	0.70%	-0.95%	2.15%	-0.01%
Jul	1.47%	-0.74%	2.27%	0.44%	-1.32%	0.73%	1.29%	1.86%	0.75%
Aug	-1.31%	-0.37%	9.33%	0.77%	-0.36%	0.95%	2.34%	-0.17%	1.40%
Sep	-1.12%	1.40%	2.02%	-2.90%	-6.70%	-1.90%	-1.79%	-0.30%	-1.41%
Oct	-0.04%	-1.67%	3.94%	1.62%	-0.90%	-2.76%	-2.98%	0.07%	-0.34%
Nov	0.59%	0.38%	-0.09%	0.57%	0.23%	-0.62%	-0.33%	-0.06%	0.08%
Dec	1.61%	1.71%	0.17%	0.16%	-0.92%	0.41%	0.01%	0.84%	0.50%
All Months	-0.42%	0.06%	2.06%	-0.06%	-1.15%	-0.46%	-0.55%	0.25%	**-0.03%**

SC

	2010	2011	2012	2013	2014	2015	2016	2017	All Years
	Variance from 2020 Parameters								
Jan	0.57%	0.19%	0.33%	0.19%	0.03%	0.66%	0.10%	0.25%	0.29%
Feb	-0.04%	0.45%	-0.03%	0.27%	-0.24%	0.54%	0.28%	-0.27%	0.12%
Mar	-0.56%	-1.91%	-0.50%	-0.41%	-0.19%	0.27%	-0.36%	-0.02%	-0.46%
Apr	-2.18%	-0.51%	-0.08%	0.50%	-2.95%	-0.02%	0.20%	-0.65%	-0.71%
May	0.46%	1.33%	0.50%	-0.27%	0.63%	1.63%	0.60%	-0.93%	0.49%
Jun	0.35%	-0.51%	2.48%	0.22%	0.46%	1.40%	-0.47%	1.30%	0.65%
Jul	-1.26%	0.12%	0.75%	4.18%	2.62%	0.95%	1.90%	2.50%	1.47%
Aug	-1.23%	0.22%	2.95%	0.10%	-0.22%	-1.12%	1.43%	0.88%	0.38%
Sep	-0.52%	-0.03%	-0.17%	-1.59%	-1.94%	-0.47%	0.08%	-0.60%	-0.65%
Oct	0.02%	-0.86%	-0.44%	0.80%	-0.59%	-1.54%	-0.55%	-0.11%	-0.41%
Nov	0.21%	-0.64%	-0.06%	-0.08%	-0.34%	0.01%	-0.07%	-0.16%	-0.14%
Dec	-0.25%	0.20%	0.63%	0.26%	-0.24%	0.52%	0.55%	0.17%	0.23%
All Months	-0.37%	-0.16%	0.53%	0.35%	-0.25%	0.23%	0.31%	0.20%	**0.10%**

SE

	2010	2011	2012	2013	2014	2015	2016	2017	All Years
	Variance from 2020 Parameters								
Jan	0.36%	-0.42%	0.30%	0.19%	0.28%	0.49%	-0.33%	0.37%	0.15%
Feb	0.45%	-0.47%	-0.22%	0.06%	-0.31%	0.48%	-0.27%	-0.27%	-0.07%
Mar	-0.23%	-0.55%	-1.25%	-0.80%	-0.41%	-0.02%	-0.49%	0.03%	-0.47%
Apr	-1.30%	-0.44%	0.22%	-1.37%	-0.12%	-0.65%	-2.42%	0.31%	-0.72%
May	2.70%	-0.86%	-2.00%	0.17%	0.02%	-0.22%	-1.71%	0.51%	-0.17%
Jun	0.03%	-1.47%	-1.90%	0.96%	-0.12%	1.95%	0.97%	1.04%	0.18%
Jul	0.73%	1.29%	4.79%	2.36%	0.53%	2.46%	2.83%	7.27%	2.78%
Aug	3.39%	1.96%	4.58%	3.47%	1.44%	2.84%	0.42%	5.22%	2.91%
Sep	0.94%	2.93%	0.40%	0.06%	0.06%	4.58%	-2.85%	1.26%	0.92%
Oct	-0.28%	-2.34%	-0.79%	0.45%	0.31%	0.07%	-0.92%	0.68%	-0.35%
Nov	0.97%	-1.77%	-0.89%	-0.63%	-1.33%	1.78%	0.04%	-0.50%	-0.29%
Dec	0.10%	-0.09%	-0.37%	0.63%	0.01%	0.03%	-0.02%	-0.28%	0.00%
All Months	0.65%	-0.19%	0.24%	0.46%	0.03%	1.15%	-0.39%	1.30%	**0.41%**

MAPE analysis – variance from 2020 parameters

SO — Variance from 2020 Parameters

SO	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	-0.56%	-0.17%	-0.14%	-0.39%	-0.31%	0.05%	-0.71%	-0.13%	-0.30%
Feb	-0.23%	-0.38%	-0.33%	0.24%	-0.10%	0.21%	-0.51%	0.17%	-0.12%
Mar	-0.91%	-0.47%	-0.81%	-0.40%	0.21%	0.51%	0.96%	-1.15%	-0.26%
Apr	-0.41%	-0.68%	-0.34%	-0.49%	-2.13%	-0.44%	-1.43%	2.12%	-0.48%
May	0.25%	2.04%	-1.00%	2.60%	2.00%	5.11%	-0.21%	4.70%	1.94%
Jun	1.27%	-0.31%	6.54%	2.68%	4.00%	1.78%	2.11%	2.44%	2.56%
Jul	2.27%	0.54%	4.30%	3.37%	0.54%	8.18%	0.78%	9.79%	3.72%
Aug	2.33%	1.23%	0.26%	4.15%	0.39%	3.69%	-0.40%	3.39%	1.88%
Sep	0.95%	3.04%	0.20%	2.29%	1.09%	-0.47%	-1.02%	-0.02%	0.76%
Oct	0.52%	-0.92%	0.60%	-0.47%	0.21%	0.32%	-0.43%	-2.02%	-0.27%
Nov	1.95%	3.27%	0.12%	-0.55%	-2.01%	1.73%	0.77%	1.44%	0.84%
Dec	-0.08%	0.00%	-2.02%	0.04%	-0.45%	-0.68%	-0.51%	-1.10%	-0.60%
All Months	0.61%	0.60%	0.61%	1.09%	0.29%	1.67%	-0.05%	1.63%	**0.81%**

SW — Variance from 2020 Parameters

SW	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	0.05%	0.74%	1.40%	0.28%	0.93%	-0.05%	0.03%	-0.03%	0.42%
Feb	-0.09%	-0.35%	0.83%	-0.77%	0.00%	0.28%	0.49%	0.28%	0.08%
Mar	0.41%	2.16%	-0.09%	0.33%	1.10%	-0.08%	0.14%	0.42%	0.55%
Apr	1.03%	-0.85%	-1.35%	1.17%	-1.01%	0.52%	2.24%	1.20%	0.37%
May	-1.35%	-0.05%	0.00%	1.08%	1.21%	-3.16%	-1.96%	1.81%	-0.30%
Jun	-2.37%	-0.89%	0.30%	0.26%	1.10%	4.22%	1.26%	1.71%	0.70%
Jul	-0.96%	1.73%	2.95%	0.95%	3.05%	1.44%	2.15%	-4.45%	0.86%
Aug	2.34%	2.90%	1.30%	0.43%	-1.17%	2.26%	1.32%	1.26%	1.33%
Sep	-1.03%	0.59%	-1.19%	2.42%	0.11%	2.38%	-1.77%	0.92%	0.30%
Oct	0.21%	-1.42%	0.51%	1.75%	0.40%	-2.05%	-1.13%	-1.79%	-0.44%
Nov	0.68%	-1.70%	-0.29%	-0.24%	-1.49%	1.63%	1.02%	1.21%	0.10%
Dec	0.56%	0.04%	0.13%	-0.79%	1.13%	0.32%	-0.31%	-0.18%	0.11%
All Months	-0.04%	0.24%	0.37%	0.57%	0.45%	0.64%	0.29%	0.20%	**0.34%**

WM — Variance from 2020 Parameters

WM	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	-0.08%	0.20%	0.41%	0.10%	-0.42%	0.05%	-0.38%	-0.36%	-0.06%
Feb	0.20%	0.14%	-0.32%	-0.29%	-0.41%	-0.22%	-0.58%	-0.10%	-0.20%
Mar	-0.60%	-0.26%	-0.57%	-0.30%	-0.26%	0.02%	-0.56%	-0.47%	-0.38%
Apr	-0.05%	-0.84%	-0.29%	-0.72%	-2.42%	-0.06%	-0.48%	-0.89%	-0.72%
May	-0.80%	0.92%	-1.67%	-1.17%	-0.21%	-0.94%	0.51%	0.56%	-0.35%
Jun	-0.11%	-1.21%	-0.76%	-0.33%	-0.28%	1.12%	-0.14%	2.50%	0.10%
Jul	0.12%	1.29%	2.05%	1.77%	0.77%	0.62%	1.43%	-0.07%	1.00%
Aug	2.50%	2.26%	2.79%	1.46%	-0.89%	1.69%	0.85%	1.20%	1.48%
Sep	-1.32%	0.03%	-0.31%	-0.59%	-1.78%	2.09%	-0.03%	-2.27%	-0.52%
Oct	1.97%	-0.78%	0.60%	-0.02%	-0.03%	-1.51%	-2.13%	0.25%	-0.21%
Nov	0.81%	-1.14%	-0.04%	0.67%	-0.59%	0.08%	0.44%	-0.71%	-0.06%
Dec	0.89%	0.59%	0.26%	0.51%	0.16%	0.66%	0.06%	0.13%	0.41%
All Months	0.30%	0.10%	0.18%	0.09%	-0.53%	0.30%	-0.08%	-0.02%	**0.04%**

WN — Variance from 2020 Parameters

WN	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	-0.17%	0.47%	0.38%	-0.43%	-0.44%	0.05%	0.06%	0.02%	-0.01%
Feb	1.46%	0.62%	0.85%	-0.69%	-0.83%	-0.23%	-0.66%	0.23%	0.09%
Mar	-0.27%	0.50%	-0.05%	0.54%	-0.19%	-0.37%	0.27%	-0.86%	-0.05%
Apr	-2.80%	0.29%	0.70%	-0.42%	-0.84%	-0.34%	0.15%	-1.14%	-0.55%
May	-3.91%	-0.32%	0.55%	0.75%	-0.79%	-2.09%	-2.50%	-3.77%	-1.51%
Jun	-5.52%	-0.46%	1.74%	-0.66%	-2.18%	1.30%	0.68%	6.19%	0.14%
Jul	-0.50%	-0.53%	0.64%	2.16%	-0.54%	0.85%	2.27%	4.50%	1.11%
Aug	-1.59%	-2.09%	8.59%	2.94%	-1.15%	1.20%	0.75%	2.08%	1.34%
Sep	-3.86%	-0.13%	-1.76%	-4.56%	-5.05%	-0.04%	-1.07%	-2.84%	-2.41%
Oct	-1.17%	-2.29%	2.74%	1.16%	-0.78%	-2.38%	-2.10%	0.03%	-0.60%
Nov	0.20%	-0.45%	0.38%	-0.85%	0.18%	0.21%	-0.92%	-1.19%	-0.31%
Dec	0.42%	0.25%	-0.81%	0.19%	-0.11%	0.61%	0.26%	0.10%	0.12%
All Months	-1.48%	-0.34%	1.16%	0.01%	-1.06%	-0.10%	-0.23%	0.28%	**-0.22%**

MAPE analysis – variance from 2020 parameters

WS	Variance from 2020 Parameters								
	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	0.02%	0.05%	-0.25%	0.08%	0.02%	0.26%	-0.31%	0.06%	-0.01%
Feb	-0.18%	-0.06%	-0.01%	0.06%	-0.09%	0.11%	-0.15%	0.12%	-0.03%
Mar	-0.59%	-1.61%	-0.32%	-0.18%	-0.17%	-0.12%	-0.01%	0.17%	-0.35%
Apr	-1.44%	-0.65%	0.00%	0.05%	-1.62%	-0.05%	-1.23%	0.05%	-0.61%
May	-0.85%	0.92%	0.07%	0.44%	-0.58%	-0.86%	0.32%	-0.07%	-0.08%
Jun	-1.26%	0.31%	1.05%	0.66%	1.14%	1.39%	2.75%	5.00%	1.38%
Jul	0.72%	0.14%	11.25%	6.42%	-0.49%	2.20%	2.20%	6.95%	3.68%
Aug	2.51%	-0.25%	2.77%	0.41%	-1.47%	1.00%	1.21%	0.04%	0.78%
Sep	-2.14%	0.36%	0.33%	2.46%	-0.42%	0.78%	-0.77%	-0.08%	0.06%
Oct	-0.22%	-0.93%	-0.36%	0.17%	0.73%	-1.55%	-1.80%	0.40%	-0.44%
Nov	0.37%	-1.09%	-0.23%	0.23%	-0.40%	0.94%	0.20%	-0.32%	-0.04%
Dec	0.17%	-0.28%	0.12%	0.01%	0.11%	-0.25%	-0.07%	0.12%	-0.01%
All Months	-0.24%	-0.26%	1.20%	0.90%	-0.27%	0.32%	0.19%	1.04%	**0.36%**

All LDZ	Simple average of LDZ results								
	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	0.06%	0.10%	0.32%	0.08%	-0.09%	0.20%	-0.23%	0.11%	0.07%
Feb	0.22%	0.02%	0.07%	-0.04%	-0.21%	0.08%	-0.22%	0.10%	0.00%
Mar	-0.36%	-0.93%	-0.29%	-0.28%	-0.03%	-0.05%	-0.17%	-0.06%	-0.27%
Apr	-1.34%	-0.53%	0.00%	-0.31%	-1.51%	-0.28%	-0.71%	-0.06%	-0.59%
May	-0.15%	0.06%	-0.79%	0.20%	0.06%	-0.55%	-0.85%	0.06%	-0.24%
Jun	-0.89%	-0.38%	0.81%	0.57%	-0.16%	1.09%	0.60%	2.22%	0.48%
Jul	0.79%	0.40%	2.89%	1.93%	0.74%	1.92%	1.52%	2.57%	1.59%
Aug	0.95%	1.00%	3.19%	1.37%	0.11%	1.56%	1.03%	1.58%	1.35%
Sep	-1.11%	1.10%	-0.10%	0.07%	-1.20%	1.52%	-0.89%	-0.57%	-0.15%
Oct	0.25%	-1.31%	0.48%	0.60%	-0.26%	-1.13%	-1.44%	0.08%	-0.34%
Nov	0.63%	-0.57%	-0.12%	-0.07%	-0.71%	0.64%	0.17%	-0.22%	-0.03%
Dec	0.25%	0.27%	-0.11%	0.21%	0.05%	0.26%	0.04%	-0.05%	0.11%
All Months	-0.06%	-0.06%	0.53%	0.36%	-0.27%	0.44%	-0.10%	0.48%	**0.16%**

LDZ MAPE Variance – Optimisation alone

MAPE analysis – variance from 2015 parameters

EA — Variance from 2015 Parameters

EA	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	-0.28%	-0.10%	0.08%	-0.13%	-0.25%	0.12%	-0.34%	-0.04%	-0.12%
Feb	-0.23%	-0.35%	0.00%	-0.05%	0.11%	-0.35%	-0.32%	0.02%	-0.15%
Mar	-0.52%	-0.51%	0.19%	-0.22%	0.05%	0.09%	-0.14%	-0.14%	-0.15%
Apr	-0.27%	0.40%	0.04%	0.23%	0.47%	-0.34%	-0.34%	-0.44%	-0.03%
May	2.72%	0.87%	-0.26%	0.60%	-0.80%	-0.13%	-0.85%	0.79%	0.37%
Jun	3.07%	0.46%	-0.99%	2.52%	-0.03%	2.34%	1.71%	2.28%	1.42%
Jul	2.90%	3.97%	3.89%	3.22%	2.88%	1.20%	2.97%	-2.29%	2.34%
Aug	3.35%	2.99%	1.61%	3.76%	2.46%	0.16%	2.91%	0.93%	2.27%
Sep	0.76%	1.75%	1.09%	1.02%	-0.52%	4.53%	-1.47%	2.24%	1.18%
Oct	0.60%	-0.90%	0.73%	0.52%	-0.23%	0.51%	-0.86%	0.62%	0.12%
Nov	0.84%	-1.32%	-0.61%	0.10%	-1.45%	1.19%	0.16%	-0.63%	-0.21%
Dec	-0.08%	-0.21%	-0.30%	-0.05%	0.14%	0.22%	-0.03%	-0.27%	-0.07%
All Months	1.07%	0.59%	0.46%	0.96%	0.24%	0.79%	0.28%	0.26%	**0.58%**

EM — Variance from 2015 Parameters

EM	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	-0.04%	-0.09%	0.20%	0.16%	-0.05%	-0.01%	-0.27%	0.01%	-0.01%
Feb	-0.02%	-0.20%	-0.05%	0.08%	0.05%	-0.07%	0.04%	0.08%	-0.01%
Mar	-0.48%	-1.31%	0.37%	-0.43%	0.19%	0.03%	-0.26%	0.67%	-0.15%
Apr	-0.30%	-0.47%	0.38%	-0.02%	-1.74%	-0.18%	-1.10%	0.86%	-0.32%
May	-0.30%	0.41%	-0.72%	-0.36%	0.09%	-0.10%	0.59%	0.75%	0.04%
Jun	1.20%	-0.28%	0.77%	0.13%	-0.04%	-1.30%	0.79%	2.95%	0.53%
Jul	1.16%	2.61%	0.96%	0.83%	0.43%	1.51%	2.41%	-2.45%	0.93%
Aug	-0.07%	2.24%	2.09%	2.16%	-0.33%	2.33%	0.90%	0.16%	1.18%
Sep	-0.69%	0.16%	1.04%	0.77%	0.38%	4.06%	0.33%	-0.47%	0.70%
Oct	0.28%	-0.29%	0.01%	0.72%	0.93%	-0.49%	-1.09%	0.18%	0.03%
Nov	0.48%	-0.66%	0.30%	0.07%	-0.77%	0.30%	0.25%	-0.22%	-0.03%
Dec	-0.38%	0.07%	0.13%	0.23%	0.23%	0.19%	0.21%	0.04%	0.09%
All Months	0.07%	0.18%	0.46%	0.36%	-0.05%	0.52%	0.23%	0.21%	**0.25%**

NE — Variance from 2015 Parameters

NE	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	0.00%	-0.14%	0.25%	0.10%	-0.14%	-0.23%	-0.19%	0.03%	-0.04%
Feb	-0.33%	0.10%	-0.23%	0.02%	0.14%	0.13%	0.09%	0.26%	0.02%
Mar	0.12%	-1.66%	0.27%	-0.28%	0.05%	-0.06%	-0.09%	1.08%	-0.07%
Apr	-0.48%	-0.35%	-0.12%	-0.24%	-0.71%	-0.07%	-0.64%	0.00%	-0.33%
May	-0.35%	-0.06%	-0.89%	-0.16%	-0.12%	-0.93%	-0.55%	2.06%	-0.12%
Jun	-0.86%	-0.26%	0.37%	0.62%	-1.97%	-1.31%	1.47%	3.72%	0.22%
Jul	1.15%	1.76%	2.87%	1.88%	0.70%	2.13%	2.08%	0.05%	1.58%
Aug	1.18%	2.10%	3.10%	0.13%	1.84%	1.36%	2.55%	0.68%	1.62%
Sep	-1.80%	1.47%	-0.45%	0.05%	-0.69%	2.79%	-0.57%	-1.58%	-0.10%
Oct	0.13%	0.03%	-0.07%	0.14%	0.28%	-0.32%	-0.92%	0.58%	-0.02%
Nov	0.57%	-0.37%	0.09%	0.29%	-0.58%	-0.23%	0.19%	-0.56%	-0.07%
Dec	-0.40%	0.08%	0.13%	0.16%	0.14%	0.13%	0.14%	-0.05%	0.04%
All Months	-0.09%	0.23%	0.44%	0.23%	-0.09%	0.28%	0.30%	0.52%	**0.23%**

NO — Variance from 2015 Parameters

NO	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	0.19%	0.15%	-0.13%	0.11%	-0.08%	0.10%	-0.28%	0.15%	0.03%
Feb	0.09%	-0.35%	0.13%	0.08%	-0.05%	0.16%	0.04%	-0.04%	0.01%
Mar	-0.25%	-1.26%	-0.31%	-0.42%	0.17%	-0.20%	-0.30%	-0.41%	-0.37%
Apr	-1.32%	-0.49%	0.04%	0.16%	-0.59%	-0.04%	-0.55%	-0.30%	-0.39%
May	0.64%	-0.81%	-0.04%	-0.76%	0.30%	-0.08%	0.27%	-0.07%	-0.07%
Jun	-1.43%	-0.31%	0.08%	-0.50%	-0.44%	-1.35%	-0.52%	0.57%	-0.49%
Jul	1.13%	-0.53%	5.86%	1.40%	2.96%	3.94%	0.32%	2.72%	2.22%
Aug	-0.13%	0.46%	2.83%	1.68%	-0.35%	1.28%	0.08%	1.12%	0.87%
Sep	-0.60%	0.21%	-0.35%	-0.24%	-0.22%	0.10%	0.59%	-0.66%	-0.15%
Oct	1.57%	0.41%	-0.68%	1.70%	-0.38%	-0.75%	-2.31%	0.86%	0.05%
Nov	0.11%	-0.54%	0.33%	-0.19%	-1.15%	0.24%	-0.12%	-0.52%	-0.23%
Dec	0.50%	0.43%	0.32%	0.44%	0.08%	-0.15%	0.18%	0.10%	0.24%
All Months	0.04%	-0.22%	0.67%	0.29%	0.02%	0.27%	-0.22%	0.29%	**0.14%**

MAPE analysis – variance from 2015 parameters

NT	Variance from 2015 Parameters								
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**All Years**
Jan	0.22%	-0.20%	0.01%	0.03%	-0.06%	0.01%	-0.22%	-0.11%	-0.04%
Feb	0.04%	-0.26%	-0.17%	0.02%	-0.07%	-0.02%	-0.19%	-0.04%	-0.09%
Mar	-0.06%	-0.26%	-0.29%	-0.23%	-0.19%	-0.04%	0.02%	0.00%	-0.13%
Apr	0.04%	0.32%	0.35%	0.26%	0.18%	-0.33%	0.09%	-0.64%	0.03%
May	1.11%	0.00%	-0.32%	-0.18%	-0.28%	-0.49%	-0.59%	-0.27%	-0.13%
Jun	1.13%	-1.14%	-1.77%	1.21%	0.00%	0.68%	0.43%	2.06%	0.32%
Jul	1.34%	0.37%	-1.18%	0.94%	1.67%	1.01%	1.39%	-2.50%	0.38%
Aug	2.59%	1.56%	0.72%	2.08%	1.18%	0.10%	0.97%	0.89%	1.26%
Sep	-0.23%	2.98%	-0.85%	1.72%	-1.01%	3.43%	-1.04%	1.29%	0.79%
Oct	0.73%	-0.73%	-0.03%	0.62%	-0.04%	0.18%	-0.42%	0.06%	0.05%
Nov	0.75%	-1.29%	-0.95%	0.19%	-1.48%	1.29%	0.33%	-0.45%	-0.20%
Dec	0.23%	-0.47%	-0.68%	0.10%	0.30%	0.39%	-0.03%	-0.42%	-0.07%
All Months	0.66%	0.07%	-0.43%	0.56%	0.02%	0.52%	0.06%	-0.01%	**0.18%**

NW	Variance from 2015 Parameters								
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**All Years**
Jan	0.34%	0.33%	0.73%	0.23%	-0.17%	0.26%	0.22%	0.04%	0.25%
Feb	1.46%	1.34%	1.33%	0.02%	-0.61%	-0.32%	-0.36%	0.65%	0.44%
Mar	0.03%	-0.16%	1.09%	-0.27%	-0.46%	-0.17%	-0.29%	0.25%	0.00%
Apr	-1.24%	-0.54%	2.01%	-0.82%	-0.80%	-0.41%	-0.09%	0.25%	-0.20%
May	-0.31%	-0.78%	0.35%	-0.17%	0.68%	-1.55%	-1.71%	-0.57%	-0.51%
Jun	-2.68%	0.27%	3.20%	-0.45%	-1.33%	0.06%	0.55%	3.39%	0.38%
Jul	1.71%	0.17%	3.11%	1.32%	-0.94%	1.10%	0.91%	2.93%	1.29%
Aug	-1.32%	-0.02%	7.91%	1.09%	-1.07%	0.83%	1.66%	0.46%	1.19%
Sep	0.44%	0.26%	2.11%	-1.85%	-4.27%	-1.24%	-0.77%	0.67%	-0.58%
Oct	0.14%	-1.09%	3.93%	2.18%	0.13%	-2.04%	-2.25%	0.60%	0.20%
Nov	0.51%	0.34%	-0.10%	0.31%	-0.03%	-0.38%	-0.16%	-0.18%	0.04%
Dec	1.38%	1.34%	-0.02%	-0.03%	-0.90%	0.24%	0.04%	0.70%	0.34%
All Months	0.04%	0.12%	2.14%	0.13%	-0.81%	-0.30%	-0.19%	0.77%	**0.24%**

SC	Variance from 2015 Parameters								
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**All Years**
Jan	0.38%	0.11%	0.11%	0.01%	0.00%	0.29%	0.06%	-0.01%	0.12%
Feb	-0.04%	0.30%	-0.13%	0.21%	-0.16%	0.31%	-0.01%	-0.21%	0.03%
Mar	-0.24%	-0.85%	-0.31%	-0.16%	-0.06%	0.16%	-0.14%	0.02%	-0.20%
Apr	-1.41%	-0.28%	-0.05%	0.33%	-1.20%	-0.31%	-0.13%	-0.21%	-0.41%
May	0.58%	2.09%	0.36%	-0.25%	0.51%	1.02%	0.79%	-0.31%	0.60%
Jun	1.22%	-0.18%	1.79%	1.12%	0.25%	1.19%	-0.37%	2.43%	0.93%
Jul	-1.61%	1.12%	2.35%	3.27%	3.47%	2.22%	2.15%	3.06%	2.00%
Aug	-1.24%	0.84%	3.85%	1.23%	0.27%	-1.01%	1.16%	1.47%	0.82%
Sep	0.33%	-0.34%	1.14%	-0.90%	-0.31%	0.42%	0.22%	-0.40%	0.02%
Oct	0.29%	-1.35%	-0.34%	0.93%	-0.03%	-0.67%	-0.64%	0.13%	-0.21%
Nov	0.06%	-0.75%	0.10%	-0.10%	-0.37%	-0.13%	0.06%	-0.13%	-0.16%
Dec	-0.34%	0.16%	0.43%	-0.02%	-0.20%	0.22%	0.35%	0.12%	0.09%
All Months	-0.17%	0.07%	0.77%	0.47%	0.18%	0.31%	0.29%	0.50%	**0.30%**

SE	Variance from 2015 Parameters								
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**All Years**
Jan	0.28%	-0.36%	0.20%	0.12%	0.10%	0.19%	-0.42%	0.00%	0.01%
Feb	0.35%	-0.42%	-0.28%	0.05%	-0.18%	0.29%	-0.11%	-0.15%	-0.06%
Mar	-0.21%	-0.98%	-0.70%	-0.62%	-0.15%	0.14%	-0.35%	0.02%	-0.36%
Apr	-1.21%	0.05%	0.43%	-0.94%	-0.13%	-0.45%	-1.34%	0.36%	-0.40%
May	2.39%	0.15%	-1.10%	-0.03%	-0.13%	0.37%	-1.27%	0.73%	0.14%
Jun	0.97%	-1.23%	-2.15%	2.38%	0.22%	1.48%	0.69%	1.43%	0.47%
Jul	1.71%	1.16%	0.42%	0.19%	1.69%	1.62%	0.76%	0.29%	0.98%
Aug	3.50%	1.59%	0.49%	2.95%	1.42%	0.68%	0.40%	2.06%	1.64%
Sep	1.22%	3.51%	0.35%	0.01%	-0.18%	3.88%	-2.69%	1.69%	0.97%
Oct	0.30%	-1.08%	-0.11%	0.80%	-0.12%	-0.16%	-0.97%	0.03%	-0.16%
Nov	0.99%	-1.78%	-1.08%	-0.27%	-1.78%	1.81%	-0.09%	-0.43%	-0.33%
Dec	0.11%	-0.50%	-0.44%	0.35%	0.20%	-0.08%	-0.14%	-0.45%	-0.12%
All Months	0.87%	0.01%	-0.33%	0.42%	0.08%	0.82%	-0.46%	0.47%	**0.23%**

MAPE analysis – variance from 2015 parameters

SO	Variance from 2015 Parameters								
	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	-0.79%	-0.40%	-0.43%	-0.42%	-0.31%	-0.10%	-0.62%	-0.17%	-0.41%
Feb	-0.36%	-0.41%	-0.39%	0.22%	0.01%	-0.01%	-0.65%	0.34%	-0.16%
Mar	-0.53%	-0.82%	-0.64%	-0.79%	-0.07%	0.59%	0.51%	-1.38%	-0.39%
Apr	-0.25%	0.08%	0.18%	0.11%	-1.20%	-1.05%	-1.00%	2.01%	-0.14%
May	0.03%	2.47%	-0.12%	2.84%	2.73%	6.46%	0.24%	6.07%	2.59%
Jun	1.26%	-0.01%	8.83%	3.87%	6.24%	2.92%	1.87%	1.64%	3.33%
Jul	2.15%	1.76%	1.48%	1.20%	2.70%	4.95%	1.39%	3.88%	2.44%
Aug	2.92%	2.69%	0.81%	3.99%	2.62%	1.50%	0.81%	0.71%	2.01%
Sep	-0.25%	3.02%	1.63%	4.22%	2.18%	0.48%	-0.64%	1.21%	1.48%
Oct	1.06%	-0.84%	0.87%	0.48%	0.62%	1.06%	-0.14%	-2.18%	0.11%
Nov	2.13%	2.73%	0.01%	-0.43%	-2.00%	2.35%	0.50%	1.00%	0.79%
Dec	-0.24%	-0.66%	-2.11%	0.01%	-0.40%	-0.40%	-0.63%	-1.46%	-0.74%
All Months	0.59%	0.80%	0.84%	1.28%	1.09%	1.56%	0.14%	0.97%	**0.91%**

SW	Variance from 2015 Parameters								
	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	-0.03%	0.43%	0.97%	0.28%	1.15%	-0.17%	-0.14%	-0.02%	0.31%
Feb	-0.14%	-0.66%	1.03%	-0.48%	-0.13%	0.03%	0.71%	0.22%	0.07%
Mar	1.00%	4.04%	-0.01%	0.27%	1.07%	0.17%	0.39%	0.67%	0.95%
Apr	3.99%	0.22%	-0.87%	1.20%	2.87%	0.46%	3.51%	1.81%	1.65%
May	0.45%	-0.67%	1.47%	1.50%	1.51%	-1.53%	-1.37%	3.83%	0.65%
Jun	-1.98%	-0.67%	0.57%	-0.05%	1.64%	3.75%	2.69%	3.10%	1.13%
Jul	-1.00%	2.18%	8.13%	3.56%	3.97%	2.84%	2.83%	-3.24%	2.41%
Aug	2.11%	3.46%	1.60%	1.07%	-0.20%	2.69%	1.27%	2.66%	1.83%
Sep	0.21%	1.09%	-0.76%	3.06%	1.65%	2.45%	-0.38%	3.63%	1.37%
Oct	0.57%	-0.04%	0.88%	2.37%	1.57%	-0.19%	-0.08%	-1.03%	0.50%
Nov	1.01%	-1.87%	-0.29%	-0.38%	-1.57%	1.98%	1.38%	1.29%	0.19%
Dec	0.44%	-0.13%	-0.41%	-0.82%	0.94%	-0.41%	-0.66%	-0.27%	-0.17%
All Months	0.55%	0.61%	1.02%	0.97%	1.20%	1.01%	0.85%	1.05%	**0.91%**

WM	Variance from 2015 Parameters								
	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	-0.11%	0.07%	0.15%	0.10%	-0.25%	-0.13%	-0.26%	-0.39%	-0.10%
Feb	0.43%	0.03%	-0.25%	-0.22%	-0.17%	-0.32%	-0.40%	-0.09%	-0.12%
Mar	-0.34%	-0.15%	-0.21%	0.07%	-0.24%	0.26%	-0.37%	-0.54%	-0.19%
Apr	0.63%	-0.84%	-0.10%	-0.06%	-0.34%	0.03%	0.07%	-0.79%	-0.18%
May	0.20%	0.90%	-1.01%	-0.73%	-0.31%	0.07%	1.09%	1.17%	0.17%
Jun	0.21%	-1.27%	0.09%	-0.30%	0.33%	0.50%	1.53%	4.60%	0.71%
Jul	0.18%	2.34%	7.32%	4.46%	2.12%	2.67%	2.82%	1.76%	2.96%
Aug	2.91%	2.11%	3.36%	2.46%	-0.25%	2.11%	0.90%	1.67%	1.91%
Sep	-0.54%	-0.03%	0.44%	0.27%	-0.94%	1.79%	0.02%	-1.18%	-0.02%
Oct	1.62%	0.61%	0.61%	0.21%	1.06%	-0.89%	-1.72%	-0.09%	0.18%
Nov	1.04%	-0.97%	0.14%	0.62%	-1.17%	0.33%	0.44%	-0.78%	-0.04%
Dec	0.91%	0.34%	0.11%	0.21%	0.17%	0.38%	0.18%	0.33%	0.33%
All Months	0.60%	0.26%	0.89%	0.59%	0.00%	0.57%	0.36%	0.47%	**0.47%**

WN	Variance from 2015 Parameters								
	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	-0.09%	0.23%	0.41%	-0.49%	-0.05%	-0.01%	-0.09%	-0.14%	-0.03%
Feb	1.11%	0.29%	0.89%	-0.68%	-0.85%	-0.14%	-0.43%	0.19%	0.05%
Mar	-0.24%	0.92%	0.18%	0.43%	-0.38%	-0.08%	0.26%	-0.48%	0.08%
Apr	-1.25%	0.34%	1.02%	0.01%	0.31%	0.00%	0.33%	-0.79%	0.00%
May	-2.80%	-0.62%	0.89%	0.61%	-0.90%	-1.69%	-1.89%	-3.21%	-1.20%
Jun	-4.32%	-0.19%	2.03%	-0.74%	-2.32%	0.52%	1.02%	5.42%	0.18%
Jul	-0.33%	-0.33%	0.75%	1.80%	-0.56%	1.01%	2.25%	3.97%	1.07%
Aug	-1.64%	-1.54%	7.54%	2.47%	-1.25%	1.15%	0.42%	1.37%	1.07%
Sep	-2.42%	-0.74%	-2.08%	-4.08%	-4.39%	-0.49%	-0.55%	-3.02%	-2.22%
Oct	-1.13%	-2.42%	2.70%	1.64%	-0.04%	-2.09%	-2.20%	0.73%	-0.35%
Nov	0.15%	-0.37%	0.40%	-0.56%	0.26%	0.04%	-0.84%	-1.32%	-0.28%
Dec	0.33%	0.12%	-0.85%	-0.10%	-0.18%	0.38%	0.22%	0.02%	-0.01%
All Months	-1.05%	-0.36%	1.16%	0.02%	-0.86%	-0.12%	-0.12%	0.23%	**-0.14%**

MAPE analysis – variance from 2015 parameters

WS	Variance from 2015 Parameters										All LDZ	Simple average of LDZ results								
	2010	2011	2012	2013	2014	2015	2016	2017	All Years		2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	0.02%	0.05%	-0.25%	0.08%	0.02%	0.26%	-0.31%	0.06%	-0.01%	Jan	0.01%	0.01%	0.18%	0.01%	-0.01%	0.04%	-0.22%	-0.05%	0.00%
Feb	-0.18%	-0.06%	-0.01%	0.06%	-0.09%	0.11%	-0.15%	0.12%	-0.03%	Feb	0.17%	-0.05%	0.14%	-0.05%	-0.15%	-0.01%	-0.13%	0.10%	0.00%
Mar	-0.59%	-1.61%	-0.32%	-0.18%	-0.17%	-0.12%	-0.01%	0.17%	-0.35%	Mar	-0.18%	-0.35%	-0.05%	-0.22%	-0.02%	0.06%	-0.06%	-0.01%	-0.10%
Apr	-1.44%	-0.65%	0.00%	0.05%	-1.62%	-0.05%	-1.23%	0.05%	-0.61%	Apr	-0.35%	-0.17%	0.25%	0.02%	-0.35%	-0.21%	-0.19%	0.17%	-0.10%
May	-0.85%	0.92%	0.07%	0.44%	-0.58%	-0.86%	0.32%	-0.07%	-0.08%	May	0.27%	0.38%	-0.10%	0.26%	0.21%	0.04%	-0.38%	0.84%	0.19%
Jun	-1.26%	0.31%	1.05%	0.66%	1.14%	1.39%	2.75%	5.00%	1.38%	Jun	-0.27%	-0.35%	1.07%	0.81%	0.29%	0.84%	1.12%	2.97%	0.81%
Jul	0.72%	0.14%	11.25%	6.42%	-0.49%	2.20%	2.20%	6.95%	3.68%	Jul	0.86%	1.29%	3.63%	2.34%	1.58%	2.19%	1.88%	1.16%	1.87%
Aug	2.51%	-0.25%	2.77%	0.41%	-1.47%	1.00%	1.21%	0.04%	0.78%	Aug	1.28%	1.40%	2.98%	1.96%	0.38%	1.09%	1.17%	1.09%	1.42%
Sep	-2.14%	0.36%	0.33%	2.46%	-0.42%	0.78%	-0.77%	-0.08%	0.06%	Sep	-0.44%	1.05%	0.28%	0.50%	-0.67%	1.77%	-0.59%	0.26%	0.27%
Oct	-0.22%	-0.93%	-0.36%	0.17%	0.73%	-1.55%	-1.80%	0.40%	-0.44%	Oct	0.46%	-0.66%	0.63%	0.96%	0.34%	-0.57%	-1.18%	0.07%	0.00%
Nov	0.37%	-1.09%	-0.23%	0.23%	-0.40%	0.94%	0.20%	-0.32%	-0.04%	Nov	0.69%	-0.61%	-0.14%	-0.01%	-0.96%	0.75%	0.18%	-0.25%	-0.04%
Dec	0.17%	-0.28%	0.12%	0.01%	0.11%	-0.25%	-0.07%	0.12%	-0.01%	Dec	0.20%	0.02%	-0.28%	0.04%	0.05%	0.07%	-0.02%	-0.11%	0.00%
All Months	-0.24%	-0.26%	1.20%	0.90%	-0.27%	0.32%	0.19%	1.04%	**0.36%**	All Months	0.23%	0.16%	0.72%	0.55%	0.06%	0.50%	0.13%	0.52%	**0.36%**

Detailed LDZ Results Follow

Results: LDZ EA

Parameter	2015	2020
Effective Temperature/AT Weight	0.500	0.4593
Effective Temperature Weight (I1)	0.719	0.714
Wind Chill Weight (I2)	0.014	0.012
Cold Weather Sensitivity (I3)	0.090	0.203
Cold Weather Upturn Threshold (V0)	3.000	0.666
Lower Warm Weather Cut-Off (V1)	15.300	14.524
Upper Warm Weather Cut-Off (V2)	19.200	19.278
Slope Relating to Warm Weather Cut-Off (q)	0.340	0.450
Wind Chill Wind Cut-Off (W0)	0.000	-1.354
Wind Chill Temperature Cut-Off (T0)	14.000	14.376
R2	**0.9910**	**0.9909**

CWV Optimisation alone

CWV Optimisation

LDZ	Station
EA	Heathrow

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	5.55%
2020	6.13%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9910	6636	
0.9909	6662	

MAPE

Month	2015	2020
Jan	3.77%	3.65%
Feb	3.24%	3.09%
Mar	4.65%	4.50%
Apr	6.63%	6.60%
May	8.13%	8.50%
Jun	6.01%	7.43%
Jul	6.38%	8.72%
Aug	6.86%	9.13%
Sep	5.50%	6.67%
Oct	6.49%	6.61%
Nov	4.51%	4.30%
Dec	4.17%	4.10%
All	5.55%	6.13%

Season				
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	3.74%	6.47%	6.42%	5.51%
2020	3.63%	6.53%	8.44%	5.87%
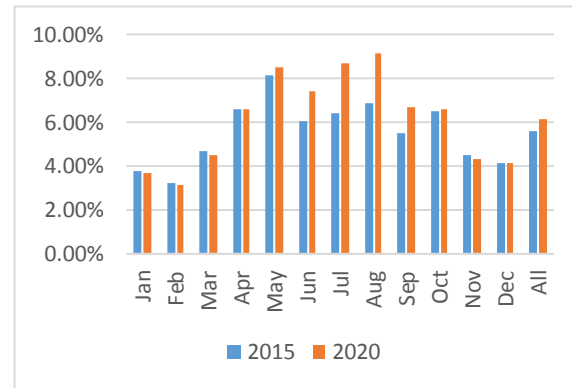
RMSE

Month	2015	2020
Jan	8286	8103
Feb	7130	6867
Mar	8887	8692
Apr	8521	8385
May	7305	7204
Jun	4084	4383
Jul	2626	3527
Aug	2838	3779
Sep	3431	3840
Oct	6222	6445
Nov	7146	7044
Dec	8412	8353
All	6636	6662

Season				
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	8058	8263	3237	5864
2020	7896	8116	3907	5947
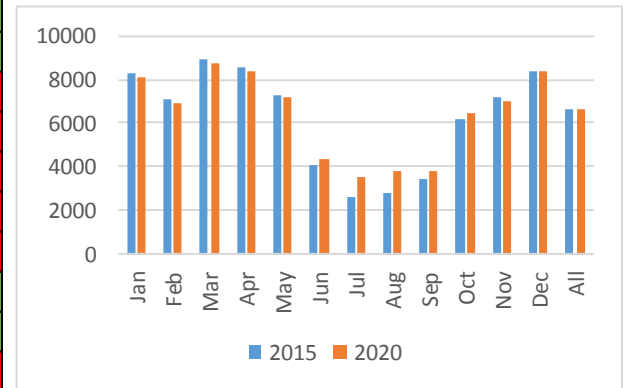
Plus Revised Temperature and Wind Weights

LDZ	Station
EA	Heathrow

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	5.55%
2020	5.91%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9910	6636	
0.9913	6552	

MAPE

Month	2015	2020
Jan	3.77%	3.75%
Feb	3.24%	3.03%
Mar	4.65%	4.37%
Apr	6.63%	6.32%
May	8.13%	8.13%
Jun	6.01%	7.12%
Jul	6.38%	8.05%
Aug	6.86%	8.60%
Sep	5.50%	6.47%
Oct	6.49%	6.32%
Nov	4.51%	4.30%
Dec	4.17%	4.24%
All	5.55%	5.91%

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	3.74%	6.47%	6.42%	5.51%
2020	3.70%	6.27%	7.93%	5.70%
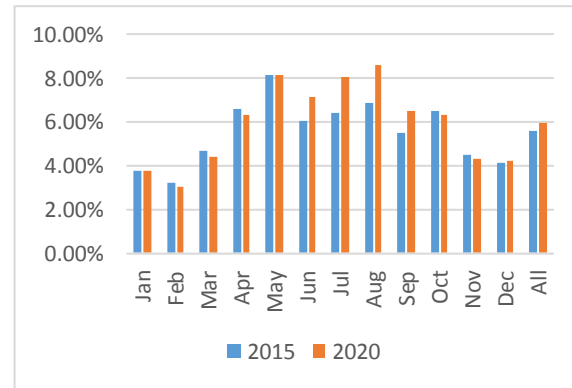
RMSE

Month	2015	2020
Jan	8286	8274
Feb	7130	6700
Mar	8887	8348
Apr	8521	8048
May	7305	6895
Jun	4084	4279
Jul	2626	3332
Aug	2838	3524
Sep	3431	3817
Oct	6222	6213
Nov	7146	7076
Dec	8412	8611
All	6636	6552

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	8058	8263	3237	5791
2020	8002	7786	3728	5870
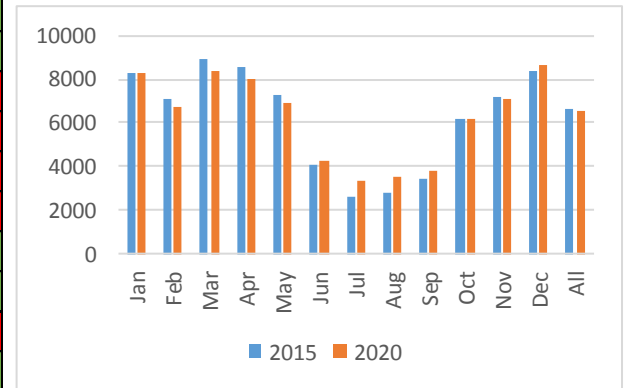
EA LDZ Pseudo SNET Profiles

2020

Fixed Wind Speed

4.00

Max CWV: V1+q(V2-V1), 16.66

Max AT

Lower Warm Weather Cut-Off (V1), 14.52

CWV(T0), 14.24

Cold Weather Upturn Threshold (V0), 0.67

-1.42

Wind Chill Temperature Cut-Off (T0), 14.38

0.5 1.43

14.66

Max AT, 19.41

CWV (Units of CWV)

Actual Temperature (Degrees C)
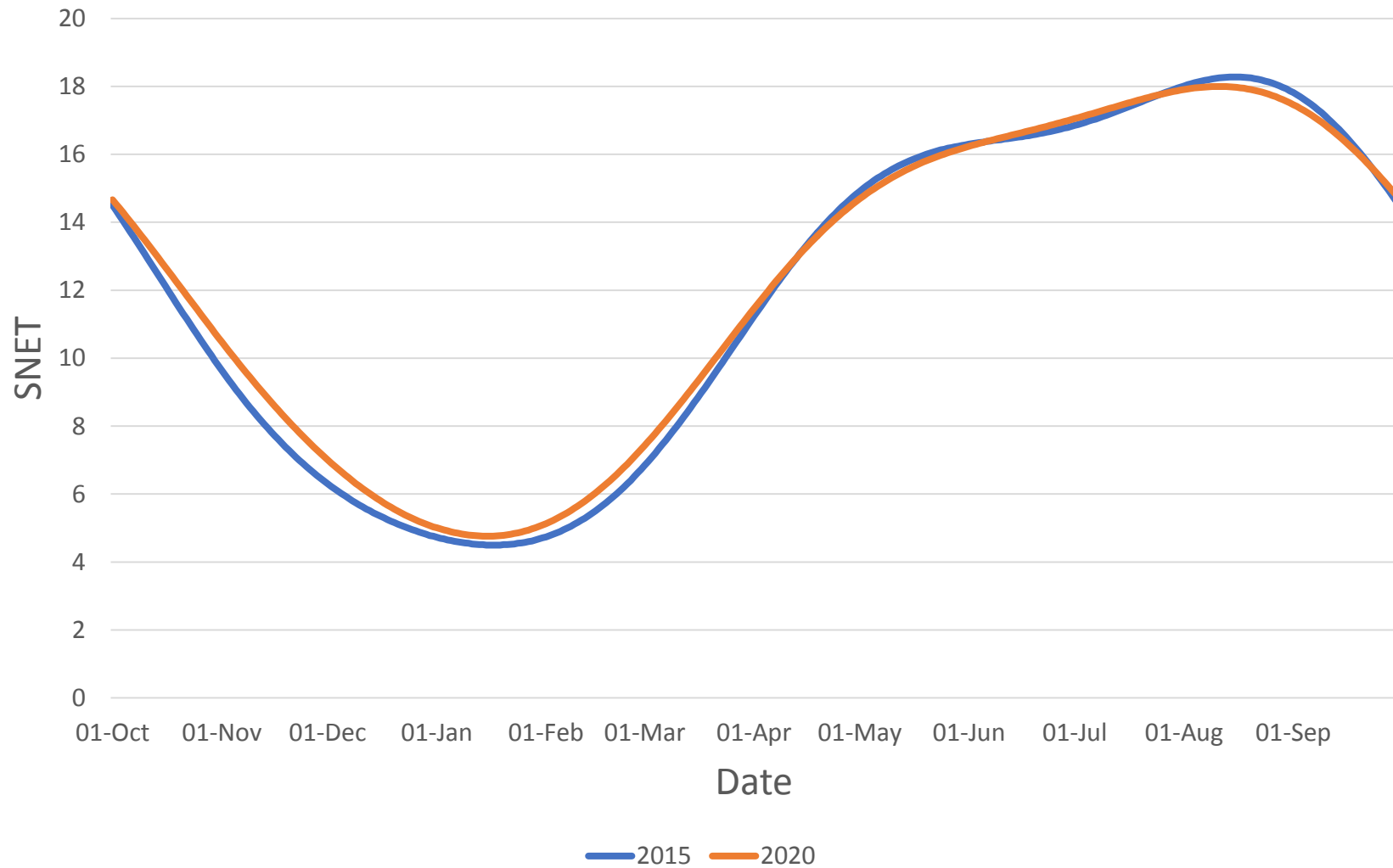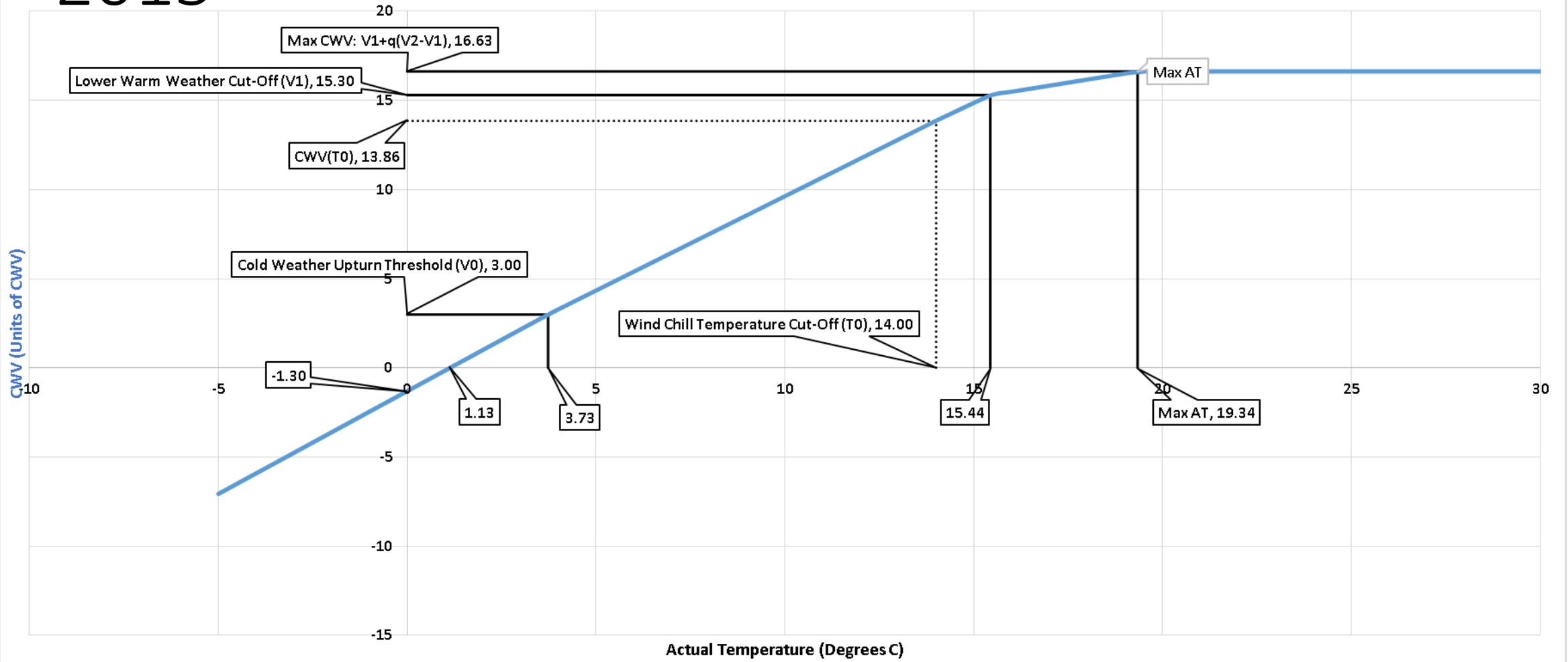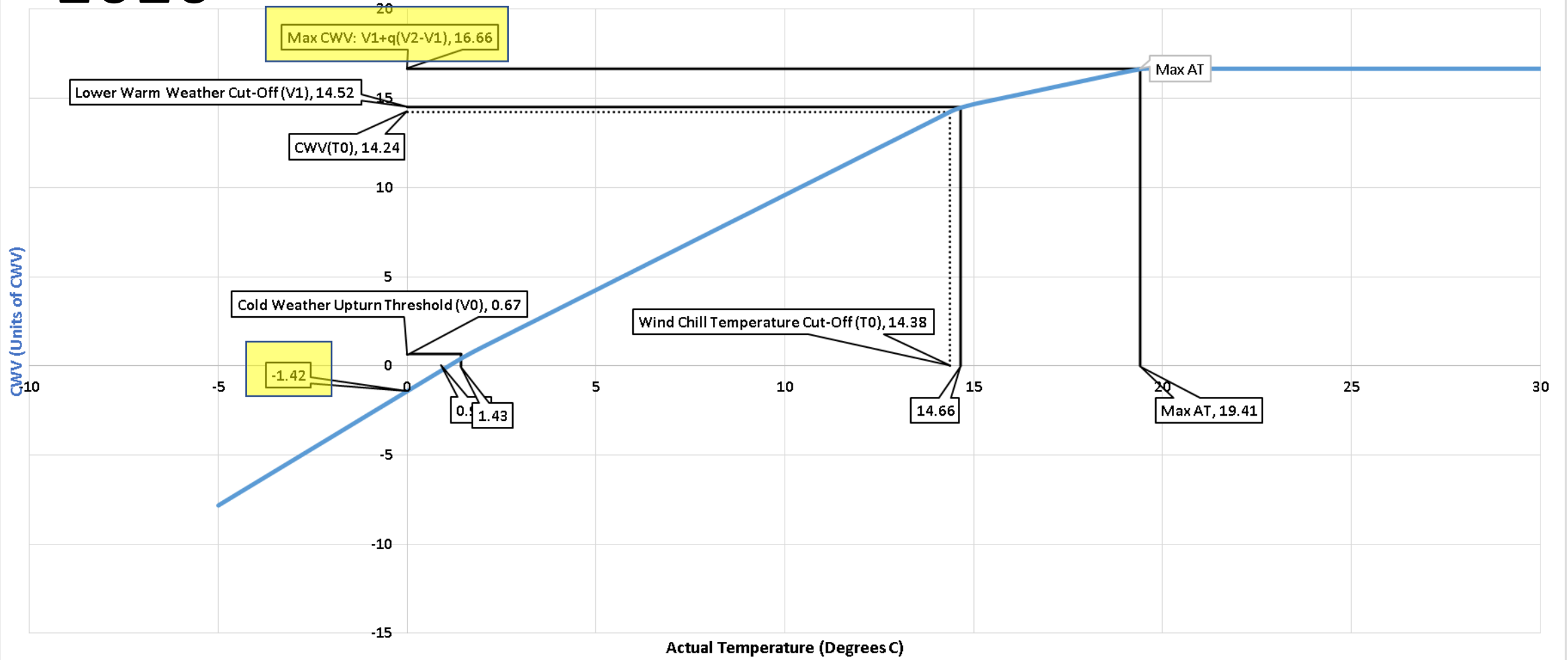
Results: LDZ EM

Parameter	2015	2020
Effective Temperature/AT Weight	0.500	0.476
Effective Temperature Weight (I1)	0.691	0.679
Wind Chill Weight (I2)	0.0144	0.014
Cold Weather Sensitivity (I3)	0.05	0.189
Cold Weather Upturn Threshold (V0)	3	1.436
Lower Warm Weather Cut-Off (V1)	13.5	13.136
Upper Warm Weather Cut-Off (V2)	16.8	17.676
Slope Relating to Warm Weather Cut-Off (q)	0.49	0.454
Wind Chill Wind Cut-Off (W0)	0	1.538
Wind Chill Temperature Cut-Off (T0)	14	14.516
R2	**0.9916**	**0.9915**

CWV Optimisation alone

CWV Optimisation

LDZ	Station
EM	Watnall (Nottingham)

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	6.67%
2020	6.92%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9916	9060	
0.9915	9153	

MAPE

Month	2015	2020
Jan	3.78%	3.77%
Feb	3.61%	3.60%
Mar	4.93%	4.78%
Apr	7.91%	7.58%
May	8.98%	9.02%
Jun	8.66%	9.19%
Jul	9.06%	9.99%
Aug	9.57%	10.76%
Sep	8.04%	8.74%
Oct	6.11%	6.14%
Nov	4.33%	4.30%
Dec	4.83%	4.92%
All	6.67%	6.92%

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.09%	7.27%	9.10%	6.16%
2020	4.11%	7.12%	9.99%	6.39%

RMSE
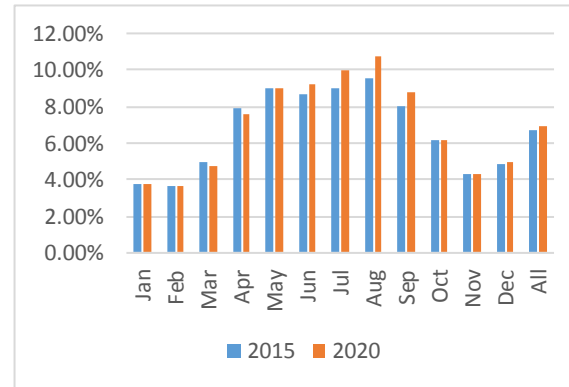
Month	2015	2020
Jan	10835	10968
Feb	10316	10233
Mar	10744	10738
Apr	11739	11549
May	9518	9473
Jun	5817	6050
Jul	4541	5140
Aug	4832	5633
Sep	6284	6592
Oct	7891	7799
Nov	9143	9177
Dec	12470	12629
All	9060	9153

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	11299	10694	5084	7842
2020	11394	10610	5615	7926
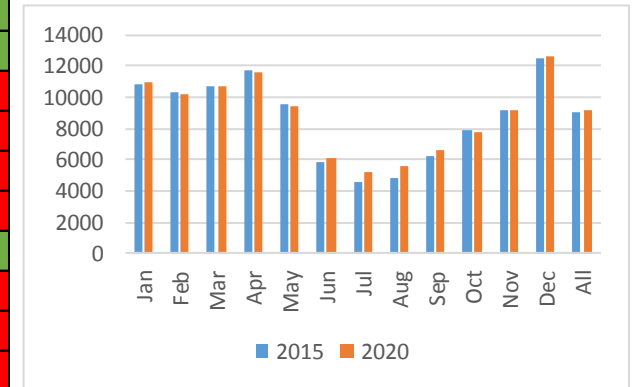
Plus Revised Temperature and Wind Weights

LDZ	Station
EM	Watnall (Nottingham)

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	6.67%
2020	6.63%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9916	9060	
0.9919	8961	

MAPE

Month	2015	2020
Jan	3.78%	3.77%
Feb	3.61%	3.56%
Mar	4.93%	4.65%
Apr	7.91%	7.09%
May	8.98%	8.45%
Jun	8.66%	8.67%
Jul	9.06%	9.18%
Aug	9.57%	10.23%
Sep	8.04%	8.51%
Oct	6.11%	5.80%
Nov	4.33%	4.35%
Dec	4.83%	5.00%
All	6.67%	6.63%

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.09%	7.27%	9.10%	6.16%
2020	4.13%	6.73%	9.37%	6.22%

RMSE
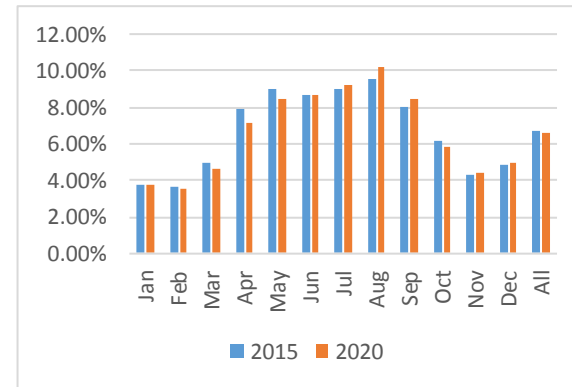
Month	2015	2020
Jan	10835	11007
Feb	10316	10157
Mar	10744	10446
Apr	11739	11028
May	9518	8922
Jun	5817	5768
Jul	4541	4588
Aug	4832	5321
Sep	6284	6499
Oct	7891	7485
Nov	9143	9304
Dec	12470	12743
All	9060	8961
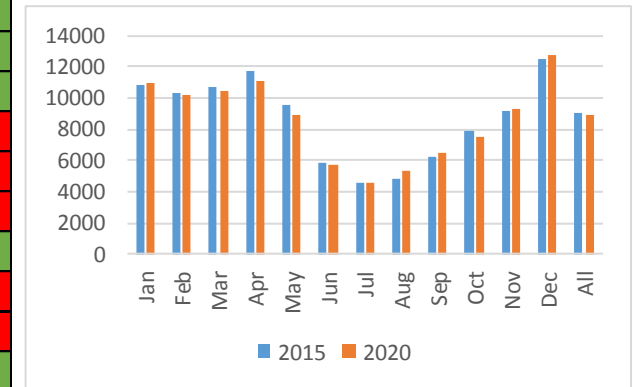
Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	11299	10694	5084	7787
2020	11430	10161	5243	7845

EM LDZ Pseudo SNET Profiles
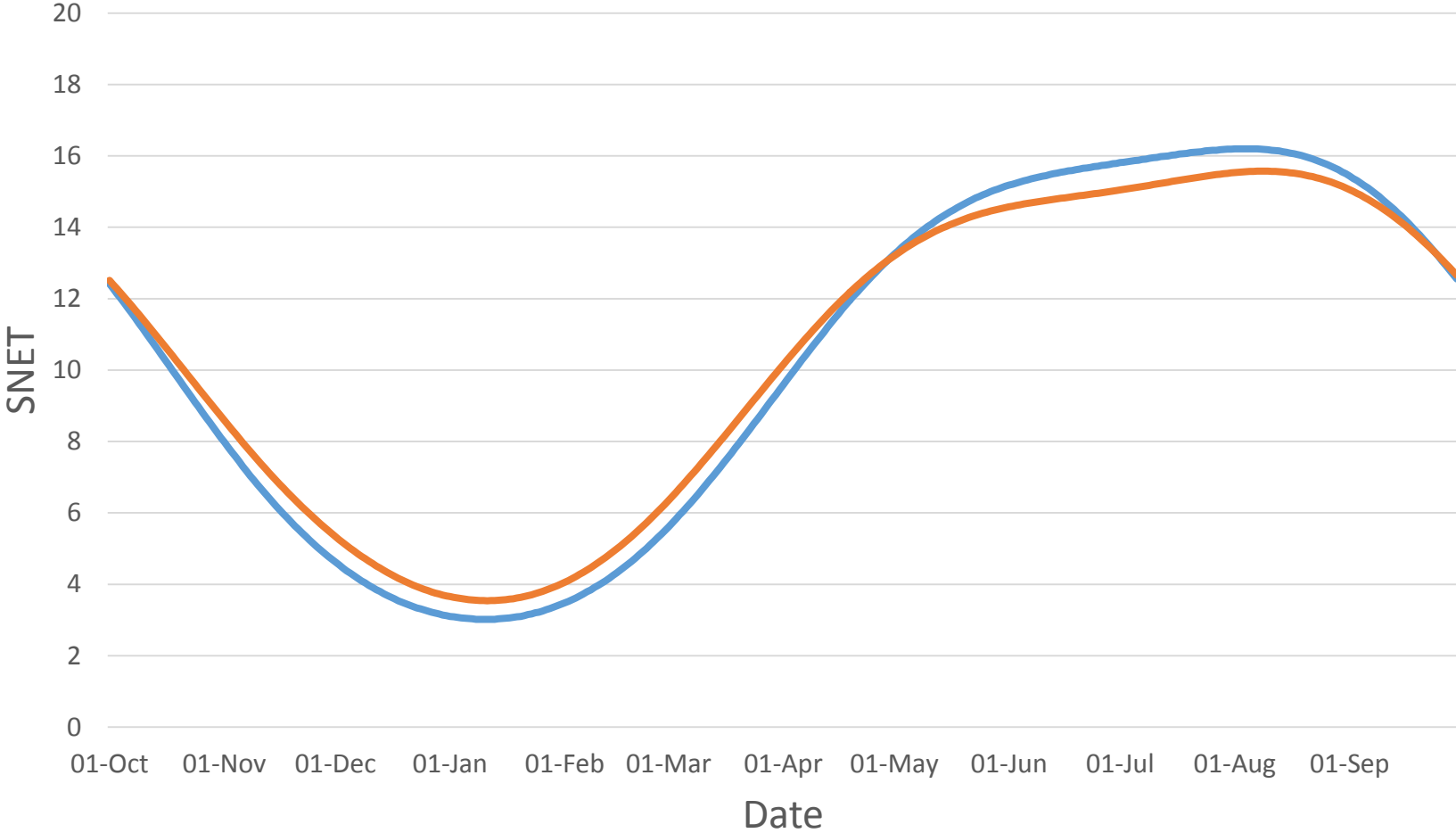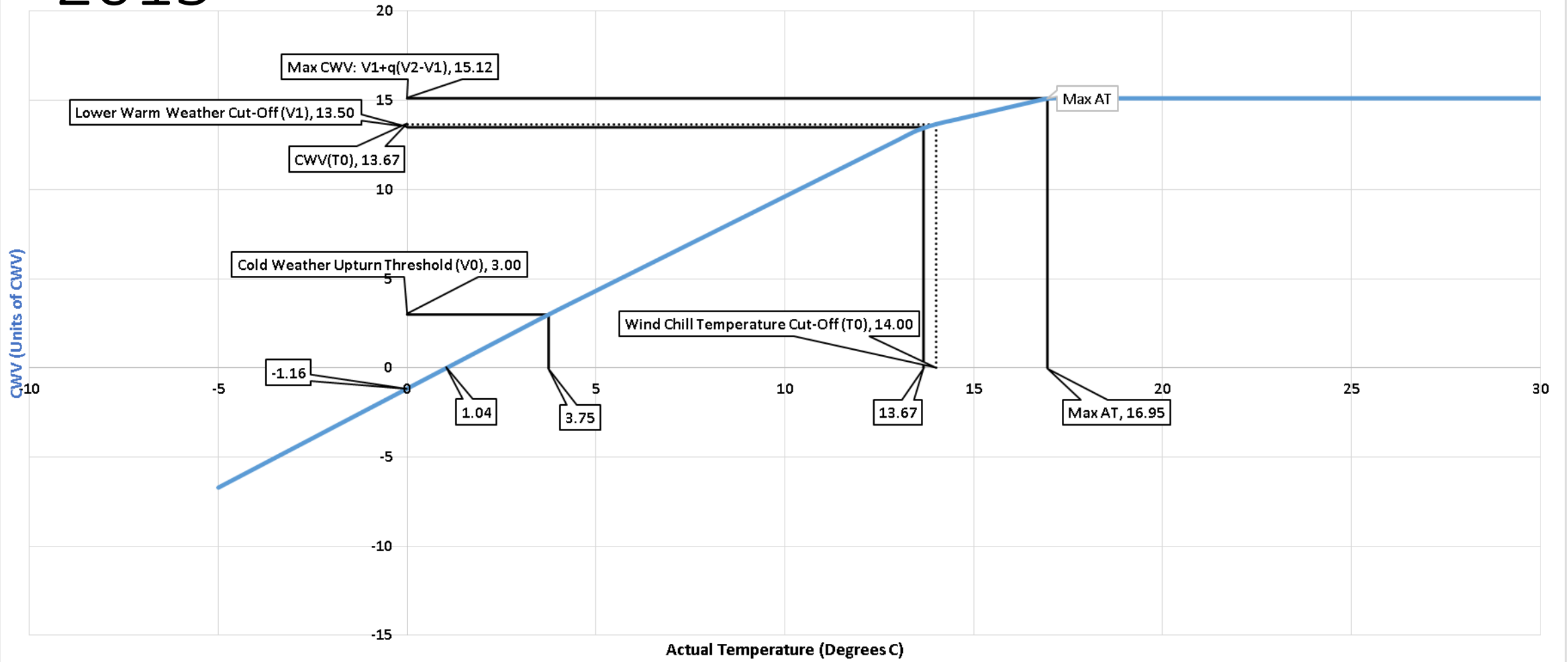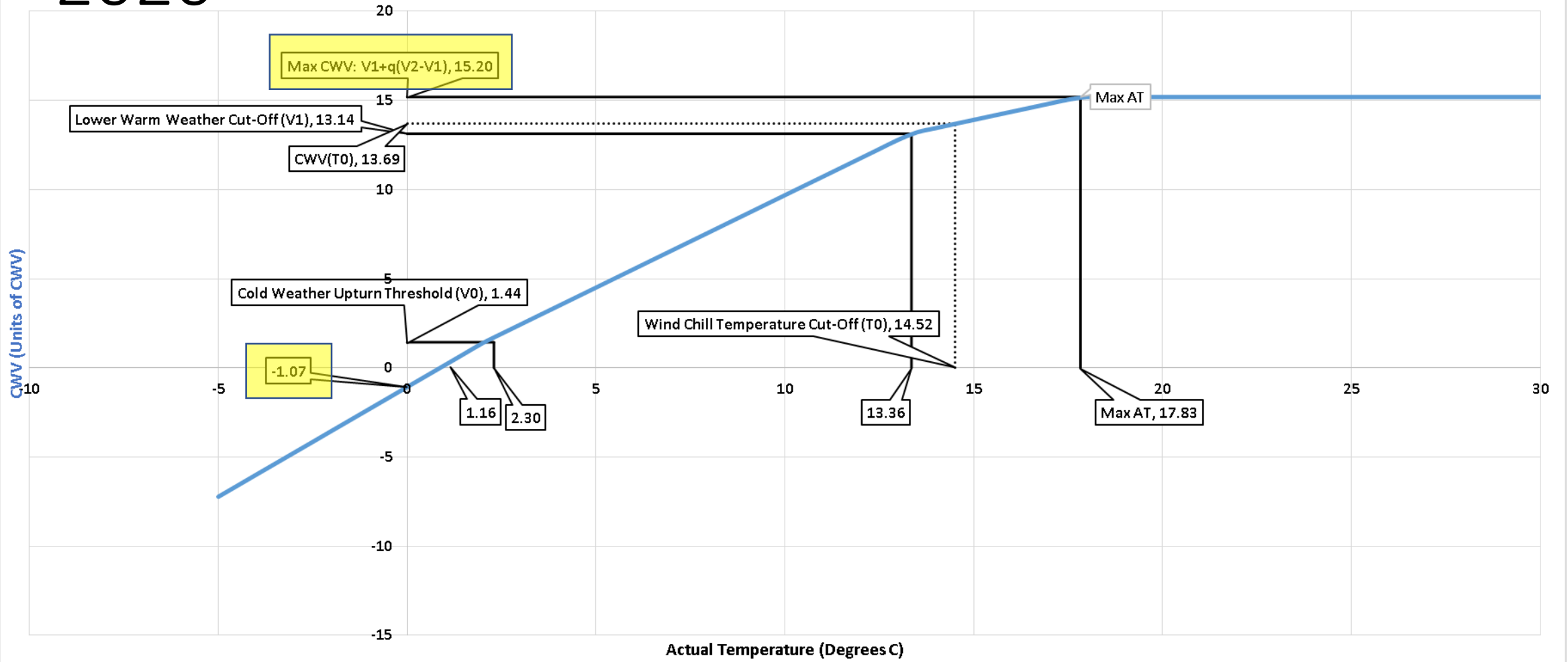
Results: LDZ NE

Parameter	2015	2020
Effective Temperature/AT Weight	0.500	0.472
Effective Temperature Weight (I1)	0.676	0.644
Wind Chill Weight (I2)	0.0159	0.018
Cold Weather Sensitivity (I3)	0	0.279
Cold Weather Upturn Threshold (V0)	0	-0.635
Lower Warm Weather Cut-Off (V1)	14.7	13.595
Upper Warm Weather Cut-Off (V2)	17.9	17.990
Slope Relating to Warm Weather Cut-Off (q)	0.38	0.488
Wind Chill Wind Cut-Off (W0)	0	0.303
Wind Chill Temperature Cut-Off (T0)	14	14.955
R2	**0.9862**	**0.9862**

CWV Optimisation alone

CWV Optimisation

LDZ	Station
NE	all (Nottingham)

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	6.78%
2020	7.01%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9862	6301	
0.9862	6327	

MAPE

Month	2015	2020
Jan	4.22%	4.18%
Feb	3.81%	3.83%
Mar	6.46%	6.39%
Apr	8.74%	8.41%
May	9.35%	9.22%
Jun	9.31%	9.53%
Jul	7.20%	8.78%
Aug	7.43%	9.05%
Sep	8.04%	7.94%
Oct	6.34%	6.32%
Nov	4.98%	4.90%
Dec	5.29%	5.33%
All	6.78%	7.01%

Season				
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.46%	8.18%	7.96%	6.45%
2020	4.47%	8.01%	9.11%	6.39%
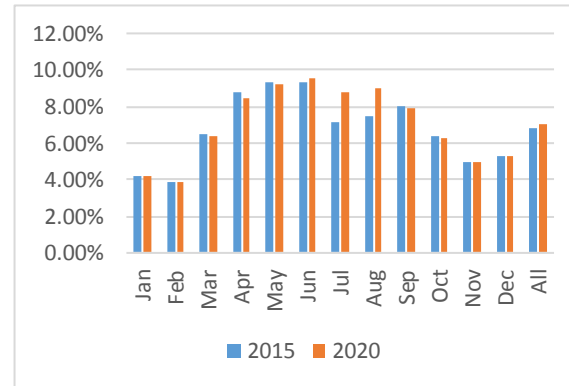
RMSE

Month	2015	2020
Jan	7351	7422
Feb	6654	6751
Mar	8717	8798
Apr	8548	8449
May	6064	6046
Jun	4480	4453
Jul	2413	2872
Aug	2719	3127
Sep	4219	3973
Oct	5289	5262
Nov	6580	6531
Dec	8379	8400
All	6301	6327

Season				
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	7547	7863	3316	5419
2020	7635	7854	3541	5357
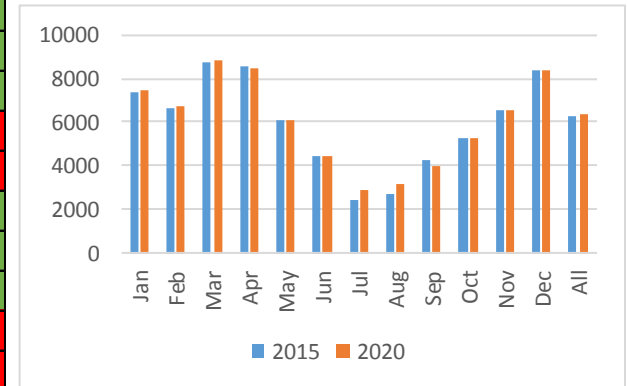
Plus Revised Temperature and Wind Weights

LDZ	Station
NE	all (Nottingham)

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	6.78%
2020	6.67%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9862	6301	
0.9867	6218	

MAPE

Month	2015	2020
Jan	4.22%	4.18%
Feb	3.81%	3.83%
Mar	6.46%	6.28%
Apr	8.74%	8.02%
May	9.35%	8.57%
Jun	9.31%	8.89%
Jul	7.20%	7.54%
Aug	7.43%	8.38%
Sep	8.04%	7.69%
Oct	6.34%	6.06%
Nov	4.98%	5.02%
Dec	5.29%	5.36%
All	6.78%	6.67%

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.46%	8.18%	7.96%	6.45%
2020	4.48%	7.62%	8.26%	6.26%
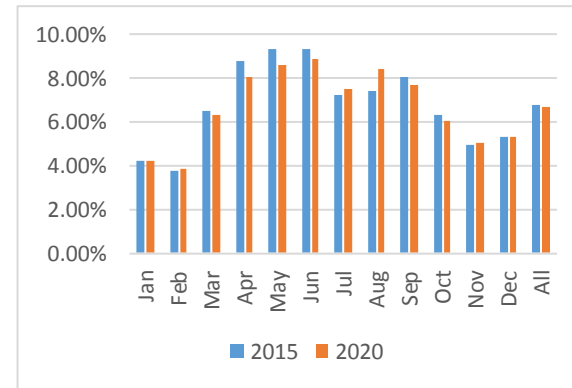
RMSE

Month	2015	2020
Jan	7351	7422
Feb	6654	6735
Mar	8717	8728
Apr	8548	8086
May	6064	5666
Jun	4480	4191
Jul	2413	2532
Aug	2719	2910
Sep	4219	3862
Oct	5289	5137
Nov	6580	6661
Dec	8379	8483
All	6301	6218

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	7547	7863	3316	5430
2020	7667	7603	3278	5342
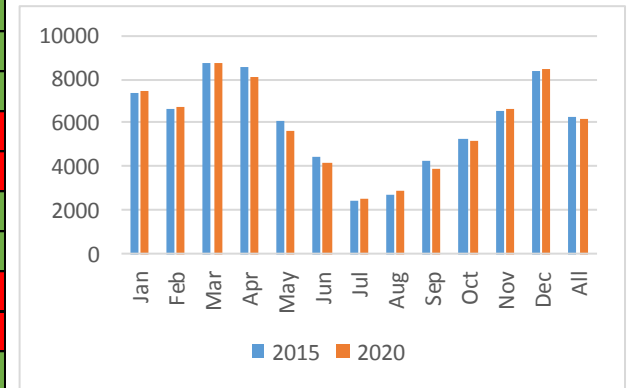
NE LDZ Pseudo SNET Profiles
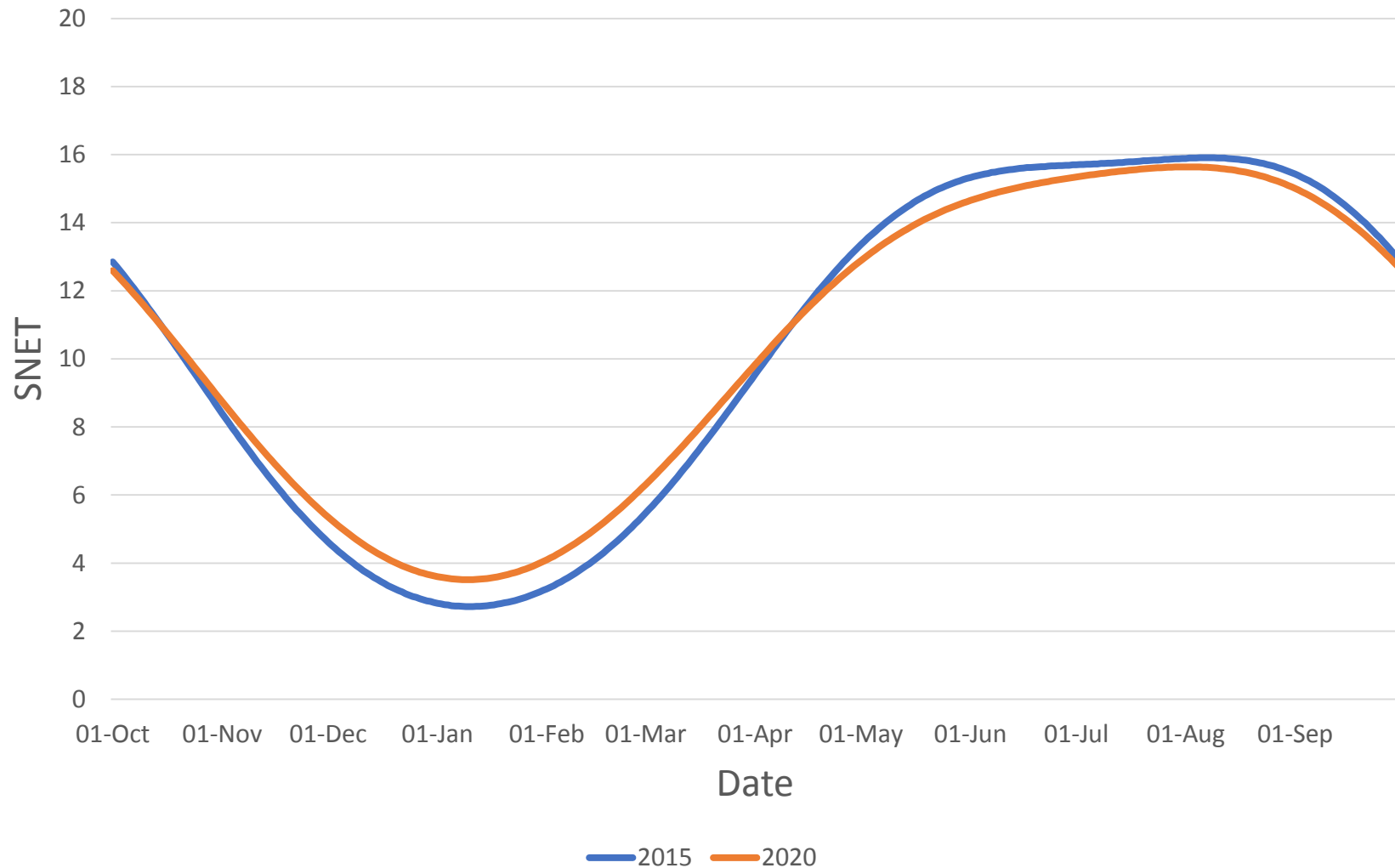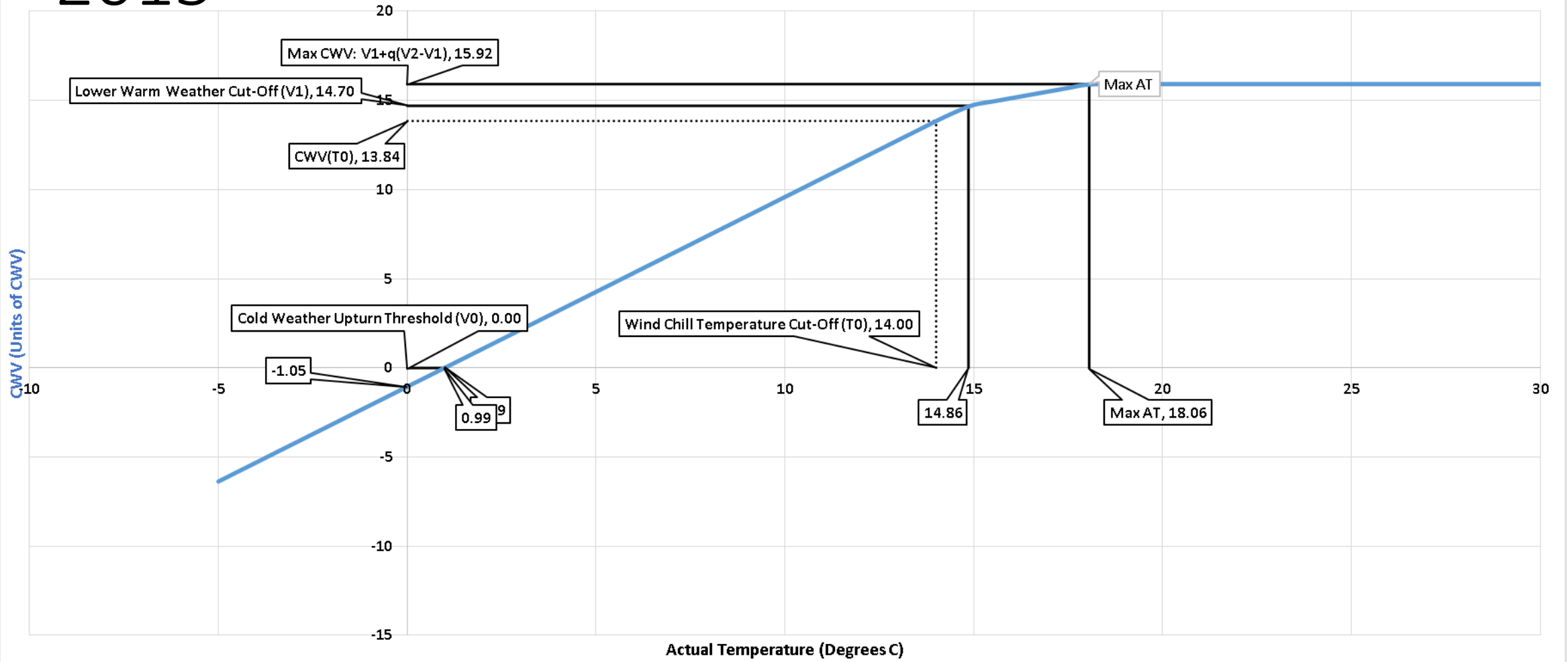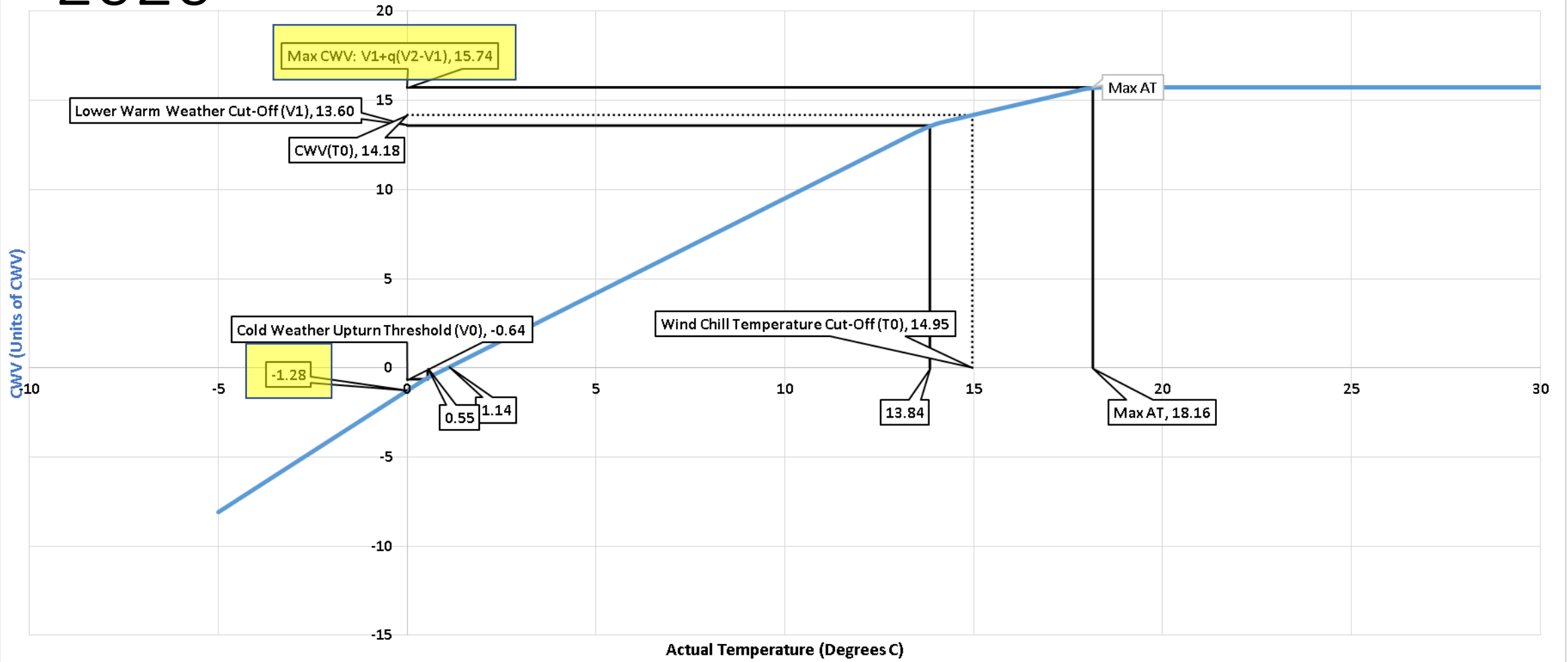
Results: LDZ NO

Parameter	2015	2020
Effective Temperature/AT Weight	0.500	0.506
Effective Temperature Weight (I1)	0.663	0.643
Wind Chill Weight (I2)	0.0086	0.010
Cold Weather Sensitivity (I3)	0.15	0.239
Cold Weather Upturn Threshold (V0)	3	1.773
Lower Warm Weather Cut-Off (V1)	13	12.299
Upper Warm Weather Cut-Off (V2)	16	18.730
Slope Relating to Warm Weather Cut-Off (q)	0.46	0.469
Wind Chill Wind Cut-Off (W0)	0	0.807
Wind Chill Temperature Cut-Off (T0)	14	14.511
R2	**0.9855**	**0.9844**

CWV Optimisation alone

CWV Optimisation

LDZ	Station
NO	Albemarle

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	7.27%
2020	7.42%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9855	5257	
0.9854	5243	

MAPE

Month	2015	2020
Jan	3.77%	3.80%
Feb	3.94%	3.95%
Mar	6.56%	6.18%
Apr	9.66%	9.27%
May	9.91%	9.84%
Jun	9.92%	9.43%
Jul	8.48%	10.71%
Aug	9.67%	10.55%
Sep	9.14%	8.99%
Oct	6.61%	6.67%
Nov	4.43%	4.20%
Dec	4.89%	5.13%
All	7.27%	7.42%

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.21%	8.70%	9.35%	6.73%
2020	4.30%	8.42%	10.24%	6.62%
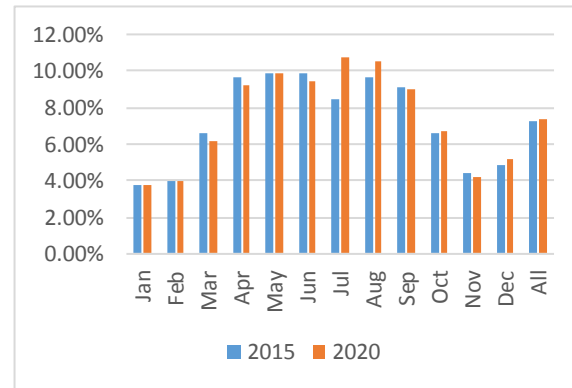
RMSE

Month	2015	2020
Jan	5281	5418
Feb	5500	5518
Mar	7318	6899
Apr	7383	7194
May	5778	5657
Jun	4025	3959
Jul	2502	3043
Aug	2920	3043
Sep	3972	3913
Oct	4648	4728
Nov	4872	4779
Dec	6340	6647
All	5257	5243

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	5790	6861	3204	4511
2020	5930	6611	3369	4494
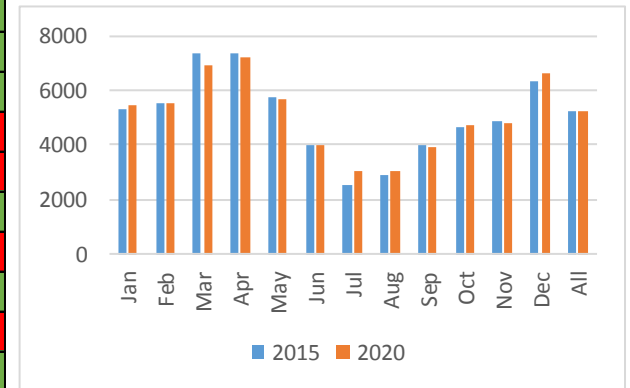
Plus Revised Temperature and Wind Weights

LDZ	Station
NO	Albemarle

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	7.27%
2020	7.24%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9855	5257	
0.9860	5142	

MAPE

Month	2015	2020
Jan	3.77%	3.86%
Feb	3.94%	3.93%
Mar	6.56%	5.91%
Apr	9.66%	8.55%
May	9.91%	9.48%
Jun	9.92%	9.36%
Jul	8.48%	10.73%
Aug	9.67%	10.56%
Sep	9.14%	8.61%
Oct	6.61%	6.11%
Nov	4.43%	4.15%
Dec	4.89%	5.33%
All	7.27%	7.24%

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.21%	8.70%	9.35%	6.73%
2020	4.39%	7.97%	10.22%	6.29%

Legend: 2015, 2020

RMSE
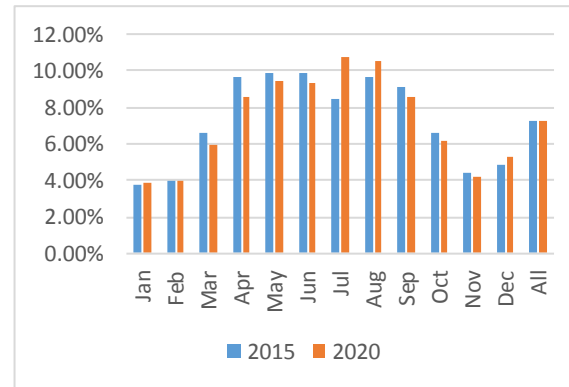
Month	2015	2020
Jan	5281	5463
Feb	5500	5473
Mar	7318	6718
Apr	7383	6783
May	5778	5477
Jun	4025	3883
Jul	2502	3027
Aug	2920	2980
Sep	3972	3771
Oct	4648	4413
Nov	4872	4726
Dec	6340	6875
All	5257	5142
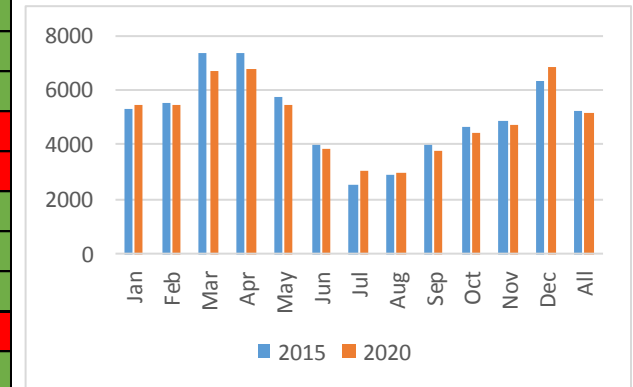
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	5790	6861	3204	4382
2020	6021	6350	3316	4323

Legend: 2015, 2020

NO LDZ Pseudo SNET Profiles

2015

Fixed Wind Speed

4.00

CWV (Units of CWV)

Actual Temperature (Degrees C)

Max CWV: V1+q(V2-V1), 14.38

Lower Warm Weather Cut-Off (V1), 13.00

CWV(T0), 13.38

Max AT

Cold Weather Upturn Threshold (V0), 3.00

Wind Chill Temperature Cut-Off (T0), 14.00

-1.20

1.01

3.53

13.20

Max AT, 16.17
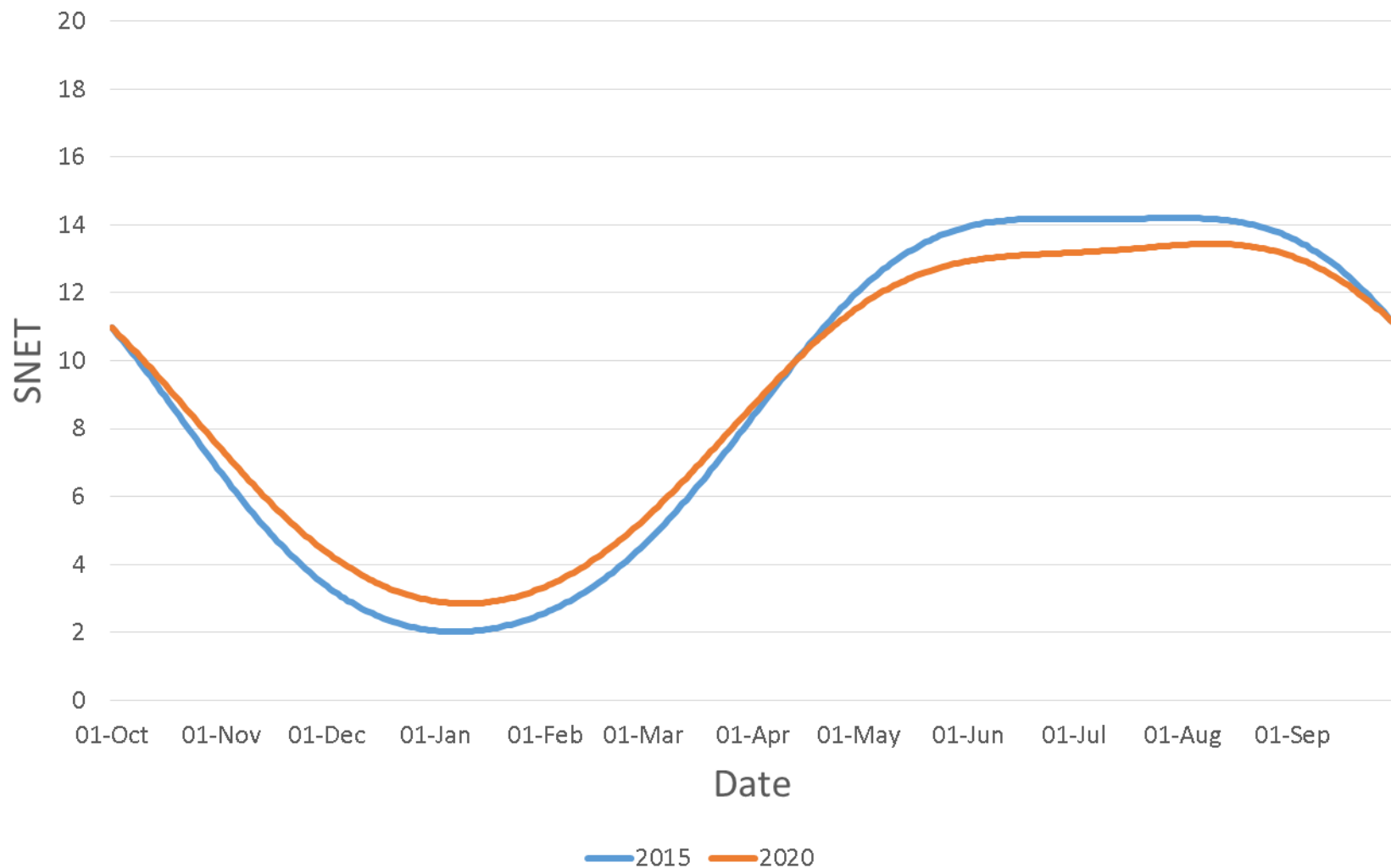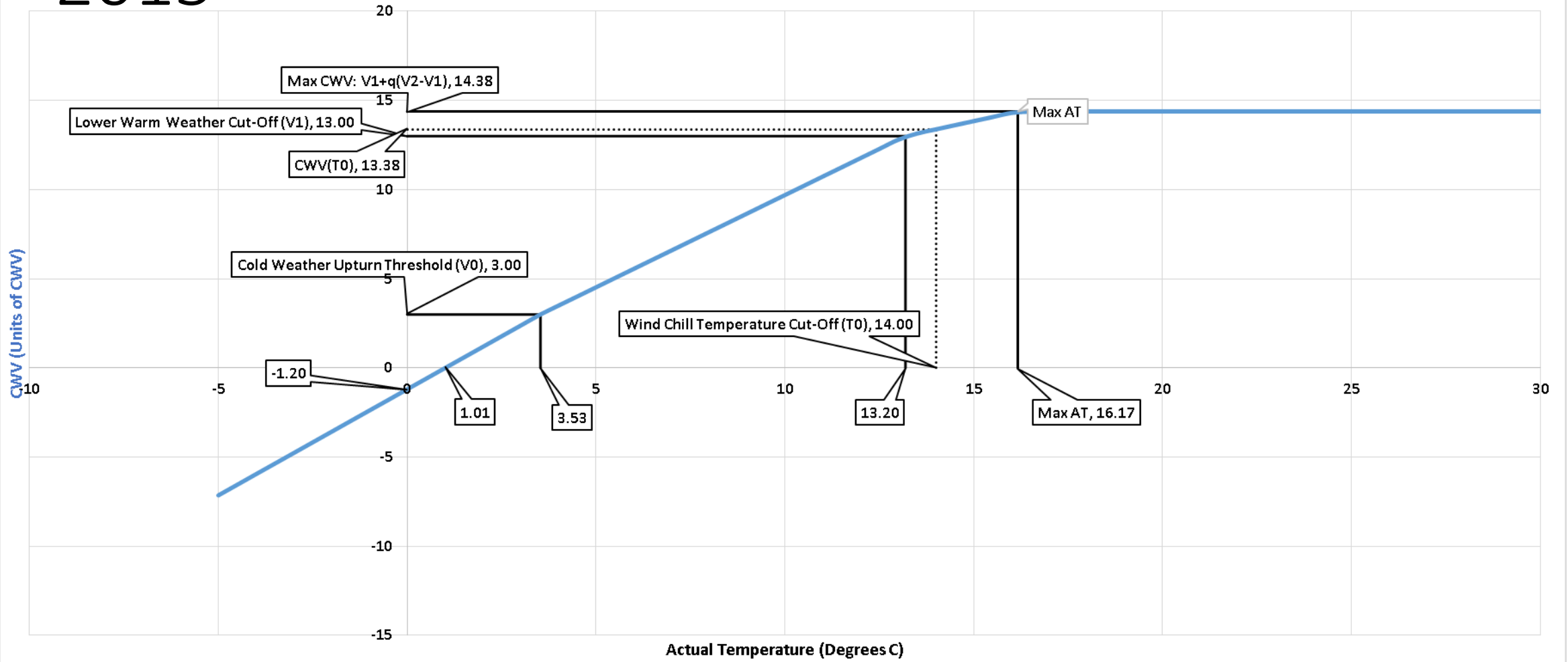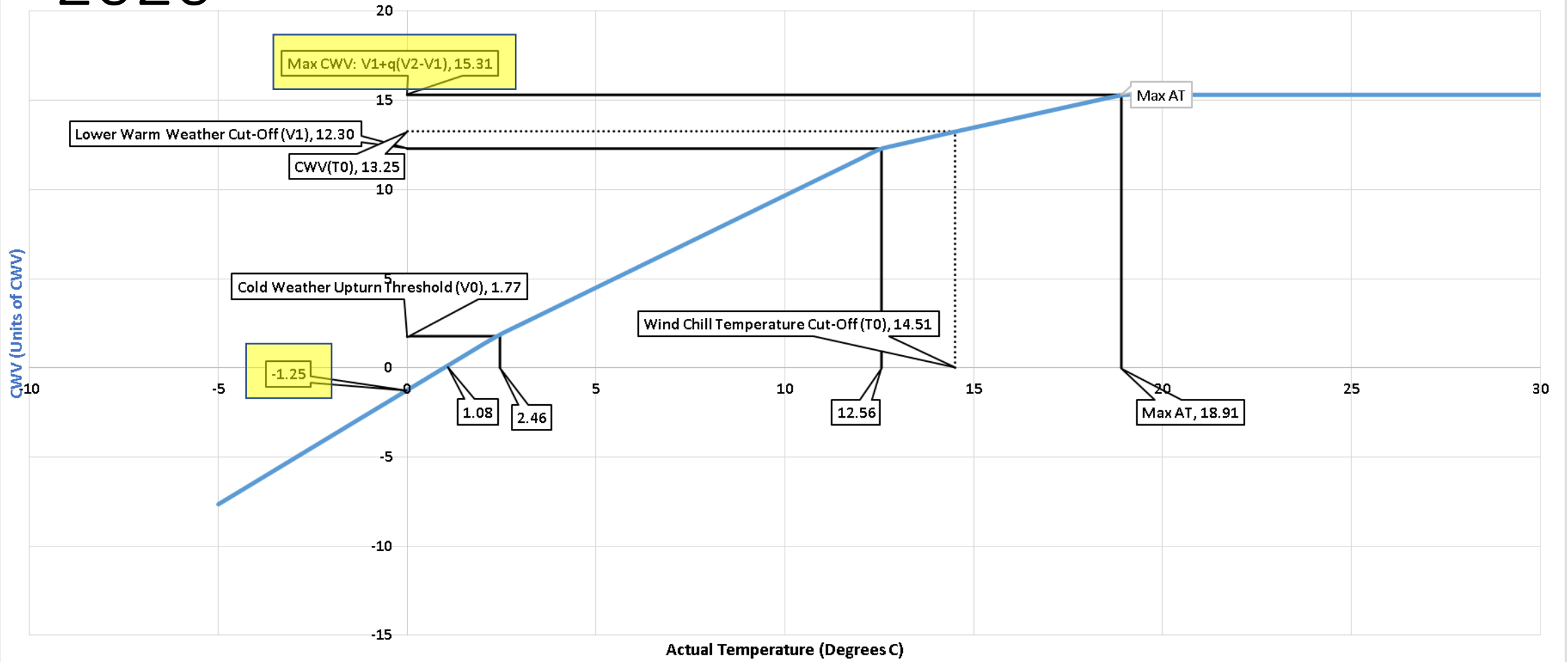
Results: LDZ NT

Parameter	2015	2020
Effective Temperature/AT Weight	0.500	0.471
Effective Temperature Weight (I1)	0.727	0.730
Wind Chill Weight (I2)	0.0151	0.015
Cold Weather Sensitivity (I3)	0.22	0.345
Cold Weather Upturn Threshold (V0)	3	2.130
Lower Warm Weather Cut-Off (V1)	15.2	14.719
Upper Warm Weather Cut-Off (V2)	19.2	19.444
Slope Relating to Warm Weather Cut-Off (q)	0.38	0.438
Wind Chill Wind Cut-Off (W0)	0	-1.157
Wind Chill Temperature Cut-Off (T0)	14	13.537
R2	**0.9928**	**0.9928**

CWV Optimisation alone

CWV Optimisation

LDZ	Station
NT	Heathrow

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	4.70%
2020	4.89%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9928	7748	
0.9928	7731	

MAPE

Month	2015	2020
Jan	3.07%	3.03%
Feb	2.92%	2.84%
Mar	4.04%	3.91%
Apr	5.87%	5.91%
May	6.79%	6.66%
Jun	5.26%	5.58%
Jul	5.11%	5.49%
Aug	4.99%	6.25%
Sep	5.17%	5.96%
Oct	5.52%	5.56%
Nov	3.76%	3.56%
Dec	3.82%	3.74%
All	4.70%	4.89%

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	3.28%	5.56%	5.12%	4.82%
2020	3.22%	5.49%	5.78%	5.03%
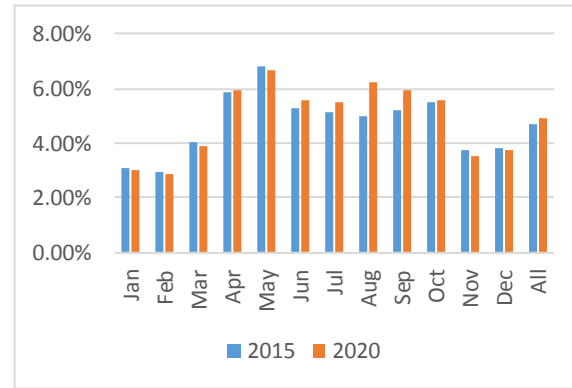
RMSE

Month	2015	2020
Jan	9072	9182
Feb	8569	8396
Mar	10281	9862
Apr	10238	10230
May	8205	8013
Jun	4993	4965
Jul	3059	3358
Aug	3104	3992
Sep	4550	4915
Oct	7360	7478
Nov	7882	7742
Dec	10308	10228
All	7748	7731

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	9483	9616	3811	6755
2020	9471	9409	4148	6839
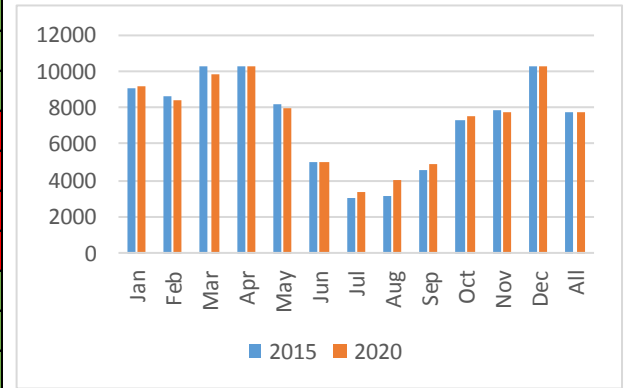
Plus Revised Temperature and Wind Weights

LDZ	Station
NT	Heathrow

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	4.70%
2020	4.86%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9928	7748	
0.9931	7564	

MAPE

Month	2015	2020
Jan	3.07%	3.17%
Feb	2.92%	2.80%
Mar	4.04%	3.68%
Apr	5.87%	5.39%
May	6.79%	6.29%
Jun	5.26%	5.62%
Jul	5.11%	6.14%
Aug	4.99%	6.68%
Sep	5.17%	5.75%
Oct	5.52%	5.35%
Nov	3.76%	3.51%
Dec	3.82%	3.81%
All	4.70%	4.86%

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	3.28%	5.56%	5.12%	4.82%
2020	3.27%	5.12%	6.16%	4.87%

RMSE
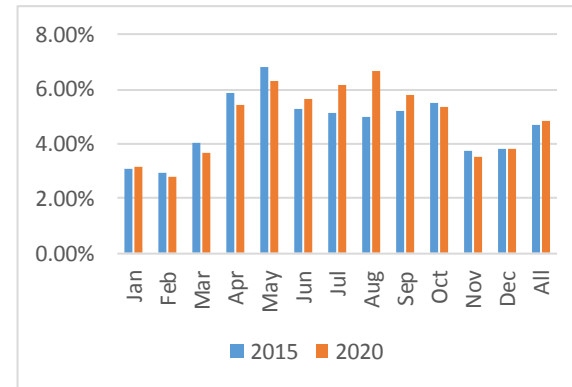
Month	2015	2020
Jan	9072	9446
Feb	8569	8238
Mar	10281	9284
Apr	10238	9504
May	8205	7532
Jun	4993	4911
Jul	3059	3647
Aug	3104	4087
Sep	4550	4951
Oct	7360	7084
Nov	7882	7650
Dec	10308	10437
All	7748	7564
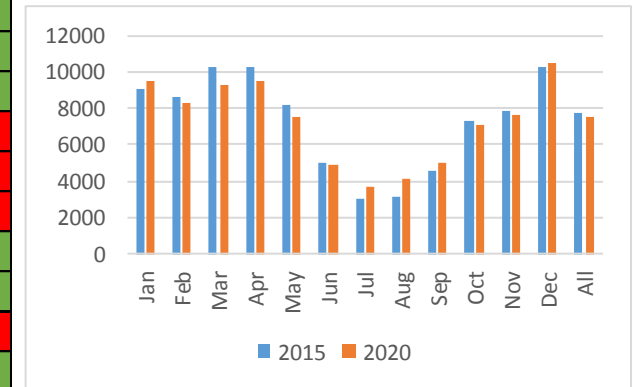
Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	9483	9616	3811	6573
2020	9597	8810	4239	6668

NT LDZ Pseudo SNET Profiles
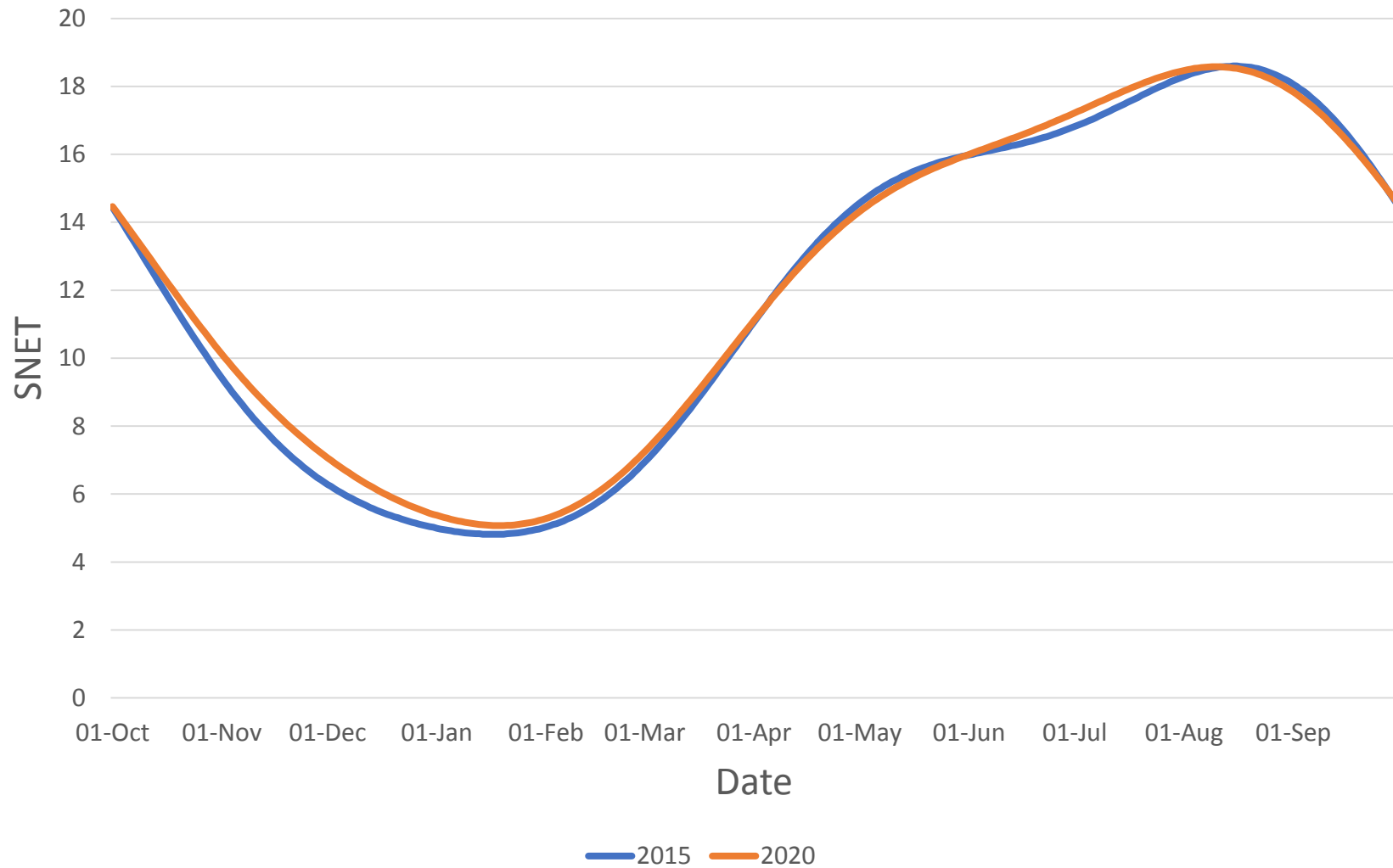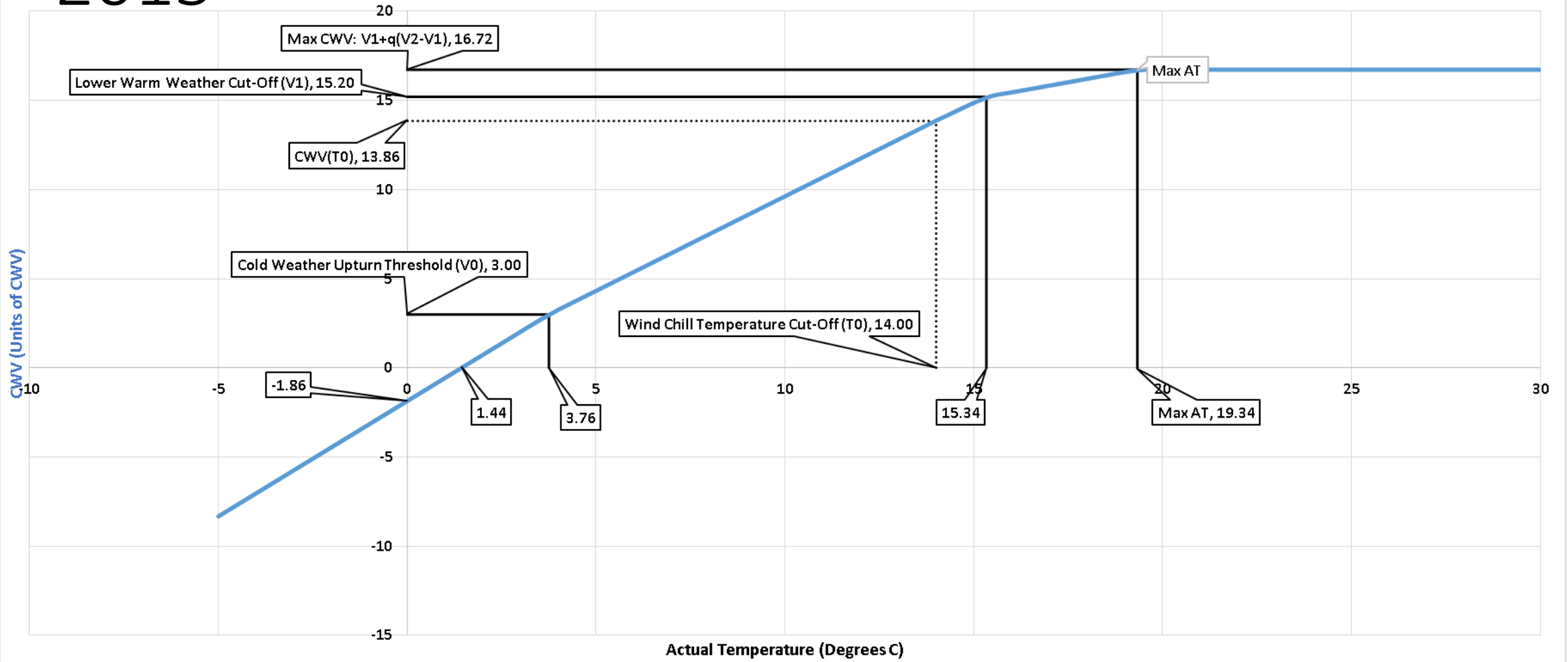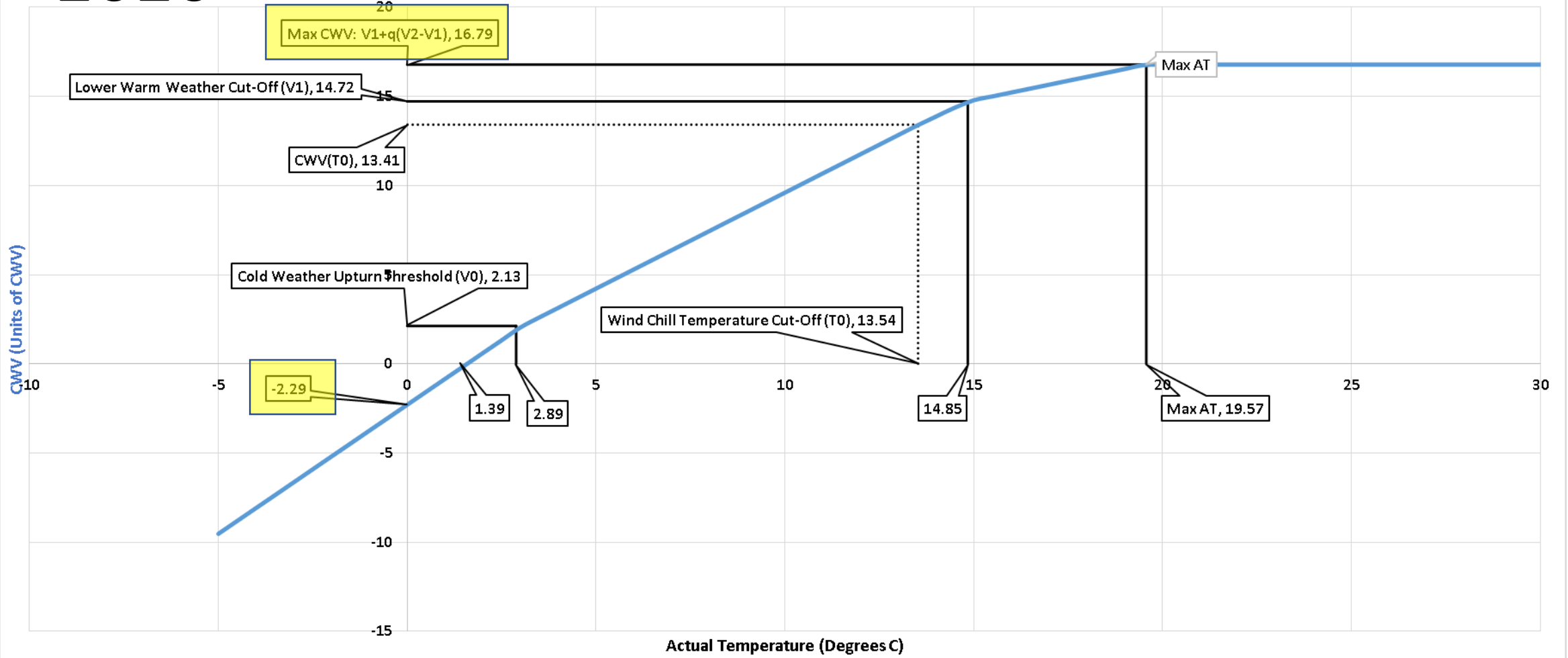
Results: LDZ NW

Parameter	2015	2020
Effective Temperature/AT Weight	0.500	0.503
Effective Temperature Weight (I1)	0.697	0.622
Wind Chill Weight (I2)	0.0149	0.018
Cold Weather Sensitivity (I3)	0.3	0.341
Cold Weather Upturn Threshold (V0)	3	1.146
Lower Warm Weather Cut-Off (V1)	14.9	14.061
Upper Warm Weather Cut-Off (V2)	18	18.690
Slope Relating to Warm Weather Cut-Off (q)	0.38	0.402
Wind Chill Wind Cut-Off (W0)	0	0.151
Wind Chill Temperature Cut-Off (T0)	14	14.179
R2	**0.9884**	**0.9878**

CWV Optimisation alone

CWV Optimisation

LDZ	Station
NW	Manchester Rostherne

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	6.59%
2020	6.83%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9884	10536	
0.9878	10963	

MAPE

Month	2015	2020
Jan	3.25%	3.50%
Feb	3.34%	3.78%
Mar	5.26%	5.27%
Apr	8.74%	8.54%
May	9.31%	8.81%
Jun	8.12%	8.49%
Jul	7.31%	8.60%
Aug	7.74%	8.93%
Sep	10.63%	10.05%
Oct	6.80%	7.00%
Nov	4.15%	4.19%
Dec	4.30%	4.65%
All	6.59%	6.83%
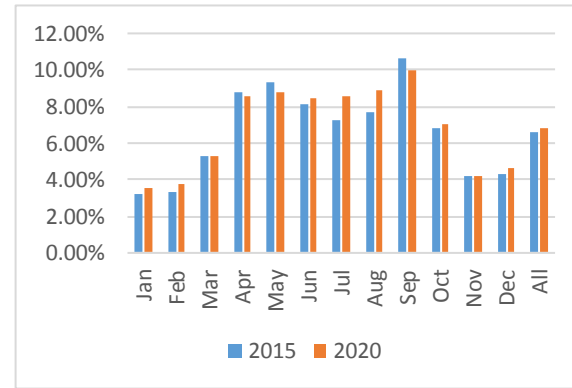
Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	3.64%	7.76%	7.72%	7.19%
2020	3.98%	7.53%	8.68%	7.08%

RMSE

Month	2015	2020
Jan	10596	11407
Feb	10717	12578
Mar	13368	13303
Apr	15169	15238
May	11082	11119
Jun	7271	7547
Jul	4604	4978
Aug	5280	5569
Sep	9979	9485
Oct	10443	10803
Nov	10247	10455
Dec	12633	14014
All	10536	10963

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	11415	13290	5811	10422
2020	12753	13305	6113	10269
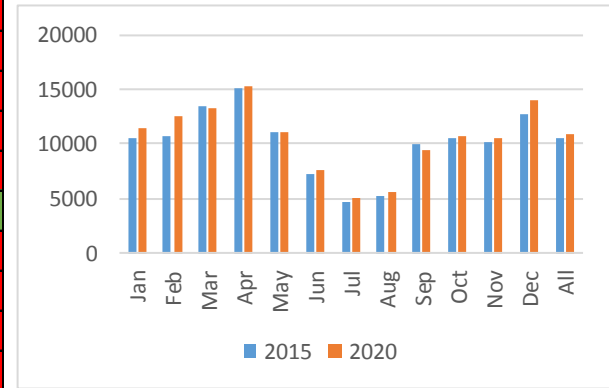
Plus Revised Temperature and Wind Weights

LDZ	Station
NW	Manchester Rostherne

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	6.59%
2020	6.56%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9884	10536	
0.9883	10768	

MAPE

Month	2015	2020
Jan	3.25%	3.55%
Feb	3.34%	3.84%
Mar	5.26%	4.96%
Apr	8.74%	7.86%
May	9.31%	8.33%
Jun	8.12%	8.11%
Jul	7.31%	8.06%
Aug	7.74%	9.13%
Sep	10.63%	9.22%
Oct	6.80%	6.46%
Nov	4.15%	4.24%
Dec	4.30%	4.80%
All	6.59%	6.56%

		Season			
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov	
2015	3.64%	7.76%	7.72%	7.19%	
2020	4.07%	7.04%	8.44%	6.64%	

RMSE

Month	2015	2020
Jan	10596	11554
Feb	10717	12889
Mar	13368	12784
Apr	15169	14481
May	11082	10588
Jun	7271	7413
Jul	4604	4669
Aug	5280	5676
Sep	9979	8706
Oct	10443	10057
Nov	10247	10576
Dec	12633	14606
All	10536	10768
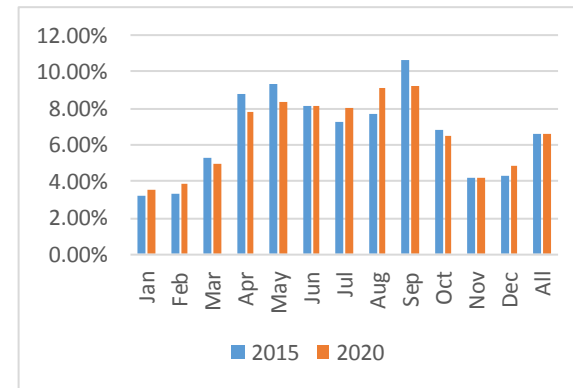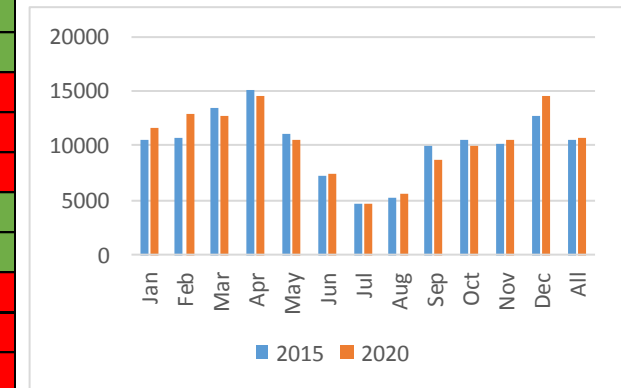
		Season			
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov	
2015	11415	13290	5811	10206	
2020	13119	12697	6010	9814	

NW LDZ Pseudo SNET Profiles

2020

Fixed Wind Speed

4.00

CWV (Units of CWV)

Actual Temperature (Degrees C)

Max CWV: V1+q(V2-V1), 15.92

Lower Warm Weather Cut-Off (V1), 14.06

CWV(T0), 13.99

Max AT

Cold Weather Upturn Threshold (V0), 1.15

Wind Chill Temperature Cut-Off (T0), 14.18

-1.97

1.41 2.20

14.25

Max AT, 18.88
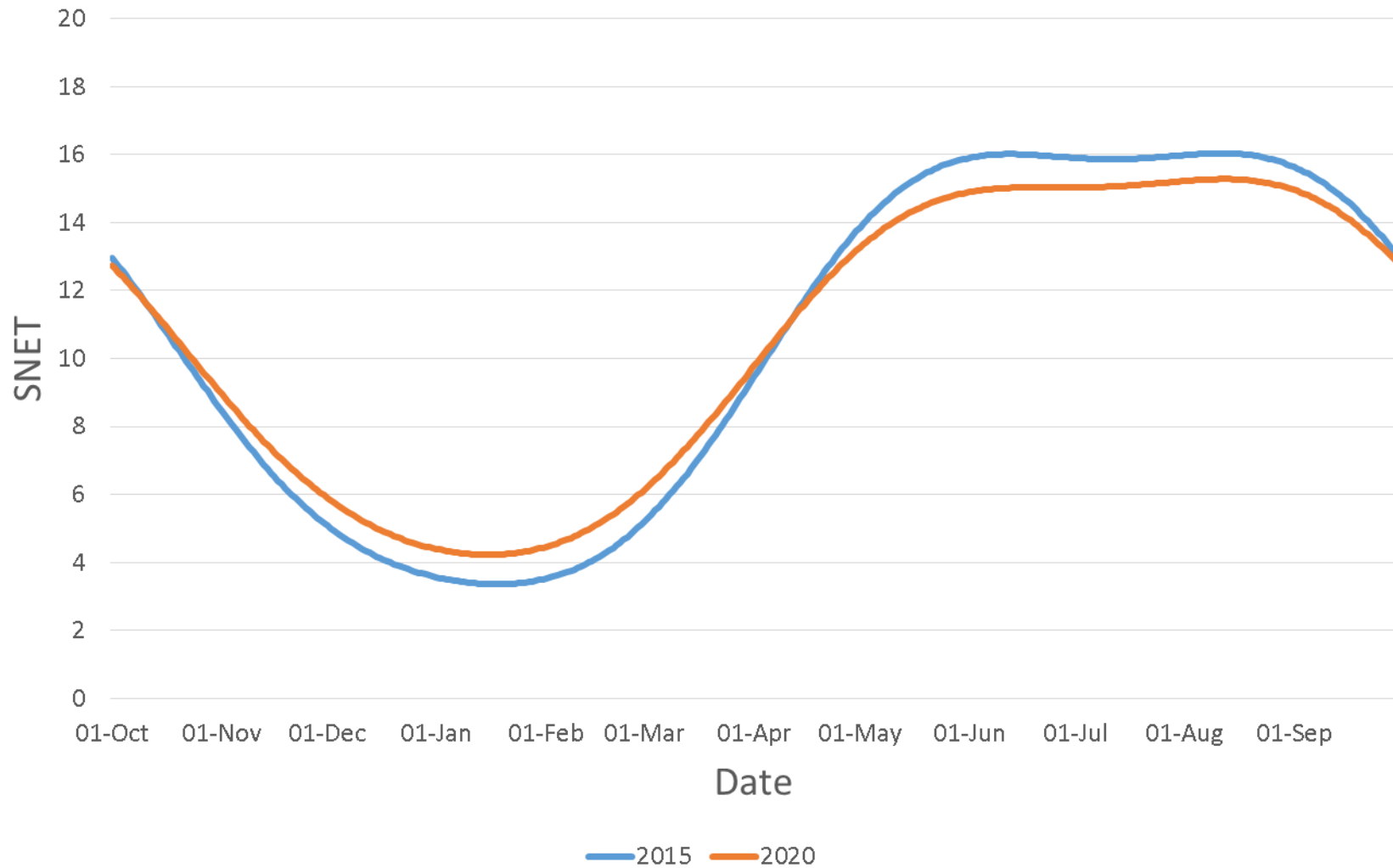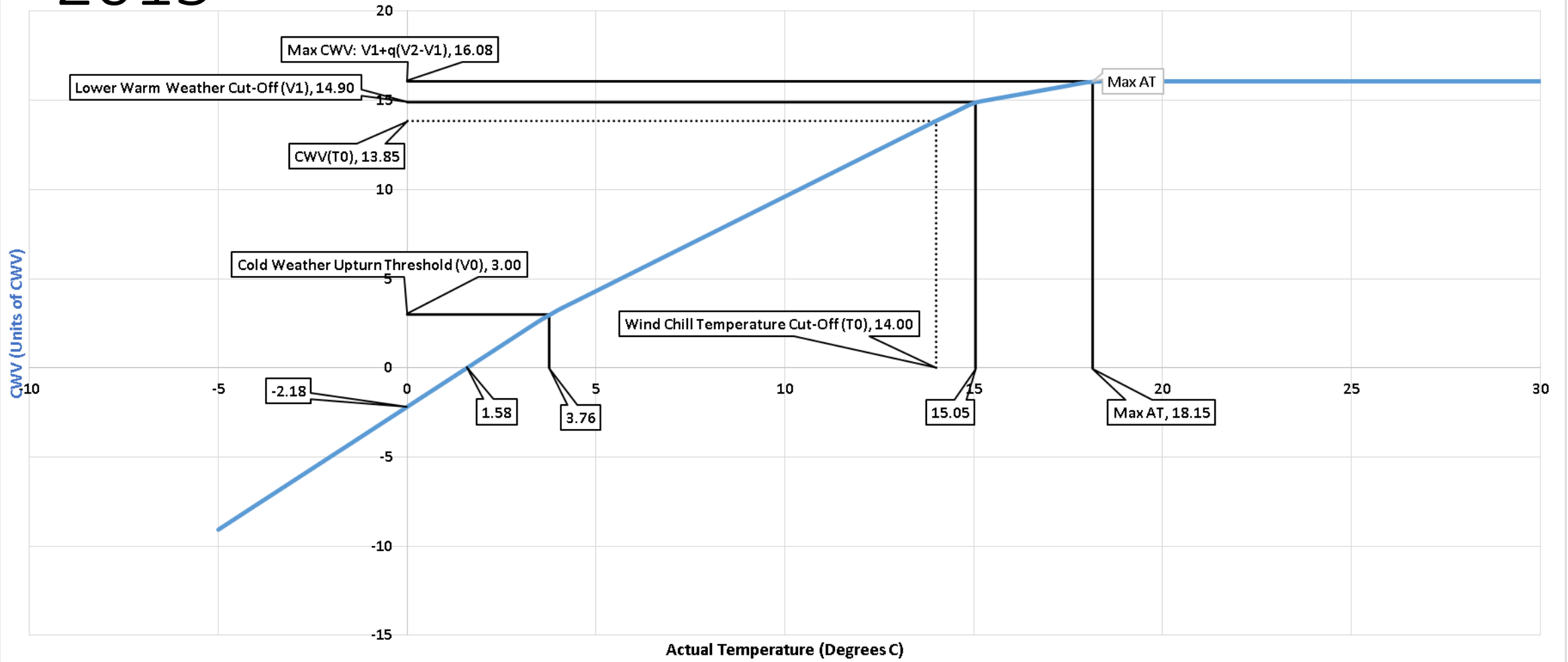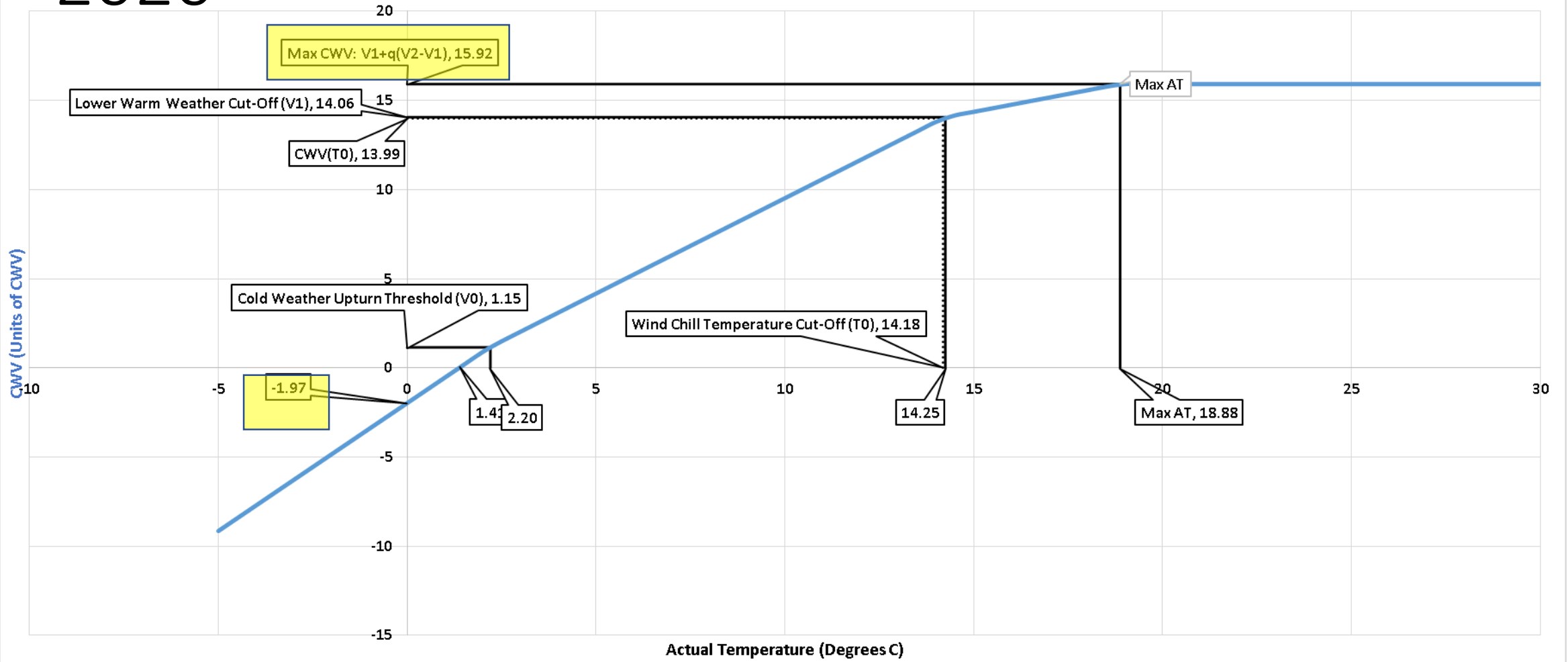
Results: LDZ SC

Parameter	2015	2020
Effective Temperature/AT Weight	0.500	0.485
Effective Temperature Weight (I1)	0.635	0.658
Wind Chill Weight (I2)	0.0119	0.012
Cold Weather Sensitivity (I3)	0.15	0.208
Cold Weather Upturn Threshold (V0)	3	2.275
Lower Warm Weather Cut-Off (V1)	12.2	12.653
Upper Warm Weather Cut-Off (V2)	16	16.327
Slope Relating to Warm Weather Cut-Off (q)	0.64	0.599
Wind Chill Wind Cut-Off (W0)	0	1.345
Wind Chill Temperature Cut-Off (T0)	14	15.411
R2	**0.9887**	**0.9886**

CWV Optimisation alone

CWV Optimisation

LDZ	Station
SC	Glasgow Bishopton

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	5.83%
2020	6.14%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9887	7624	
0.9886	7704	

MAPE

Month	2015	2020
Jan	3.33%	3.45%
Feb	3.13%	3.16%
Mar	4.83%	4.63%
Apr	7.20%	6.80%
May	7.36%	7.96%
Jun	8.01%	8.94%
Jul	7.37%	9.33%
Aug	7.52%	8.35%
Sep	7.91%	7.93%
Oct	5.22%	5.01%
Nov	3.80%	3.64%
Dec	3.97%	4.06%
All	5.83%	6.14%

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	3.49%	6.45%	7.70%	5.64%
2020	3.57%	6.46%	8.96%	5.53%
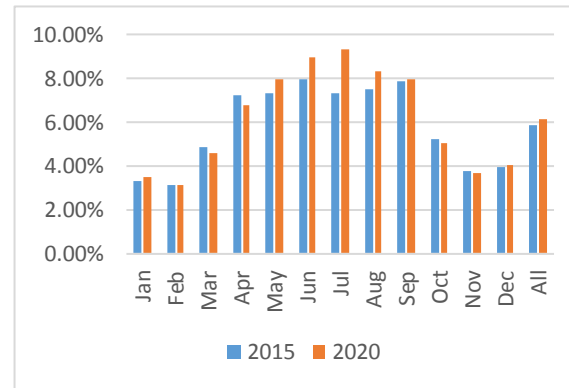
RMSE

Month	2015	2020
Jan	7874	8148
Feb	7188	7305
Mar	9211	8891
Apr	10321	9914
May	7400	7709
Jun	5886	6151
Jul	7138	7886
Aug	5754	6110
Sep	6370	6403
Oct	6778	6545
Nov	7093	6803
Dec	9028	9333
All	7624	7704

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	8142	9043	6295	6574
2020	8391	8872	6773	6585
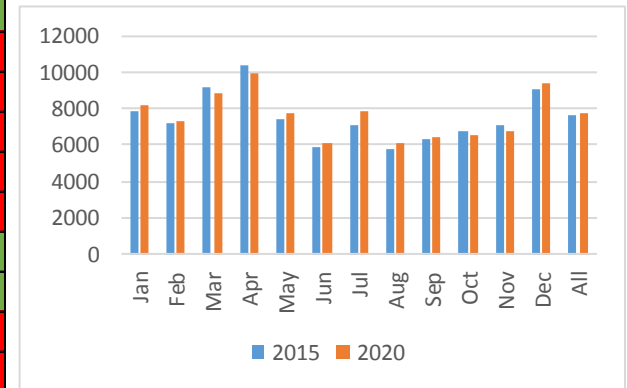
Plus Revised Temperature and Wind Weights

LDZ	Station
SC	Glasgow Bishopton

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	5.83%
2020	5.94%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9887	7624	
0.9890	7629	

MAPE

Month	2015	2020
Jan	3.33%	3.62%
Feb	3.13%	3.25%
Mar	4.83%	4.37%
Apr	7.20%	6.49%
May	7.36%	7.85%
Jun	8.01%	8.66%
Jul	7.37%	8.82%
Aug	7.52%	7.90%
Sep	7.91%	7.26%
Oct	5.22%	4.81%
Nov	3.80%	3.66%
Dec	3.97%	4.20%
All	5.83%	5.94%

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	3.49%	6.45%	7.70%	5.64%
2020	3.70%	6.23%	8.54%	5.24%

RMSE
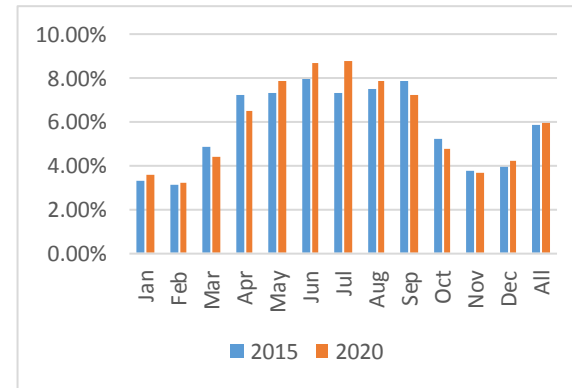
Month	2015	2020
Jan	7874	8550
Feb	7188	7572
Mar	9211	8470
Apr	10321	9602
May	7400	7738
Jun	5886	5936
Jul	7138	7743
Aug	5754	5945
Sep	6370	5942
Oct	6778	6230
Nov	7093	6842
Dec	9028	9588
All	7624	7629
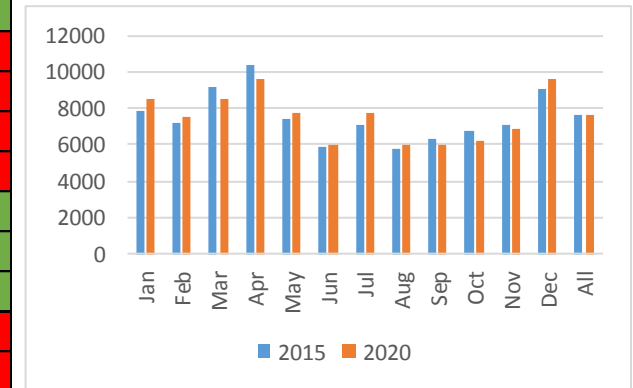
Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	8142	9043	6295	6483
2020	8691	8627	6603	6348

SC LDZ Pseudo SNET Profiles
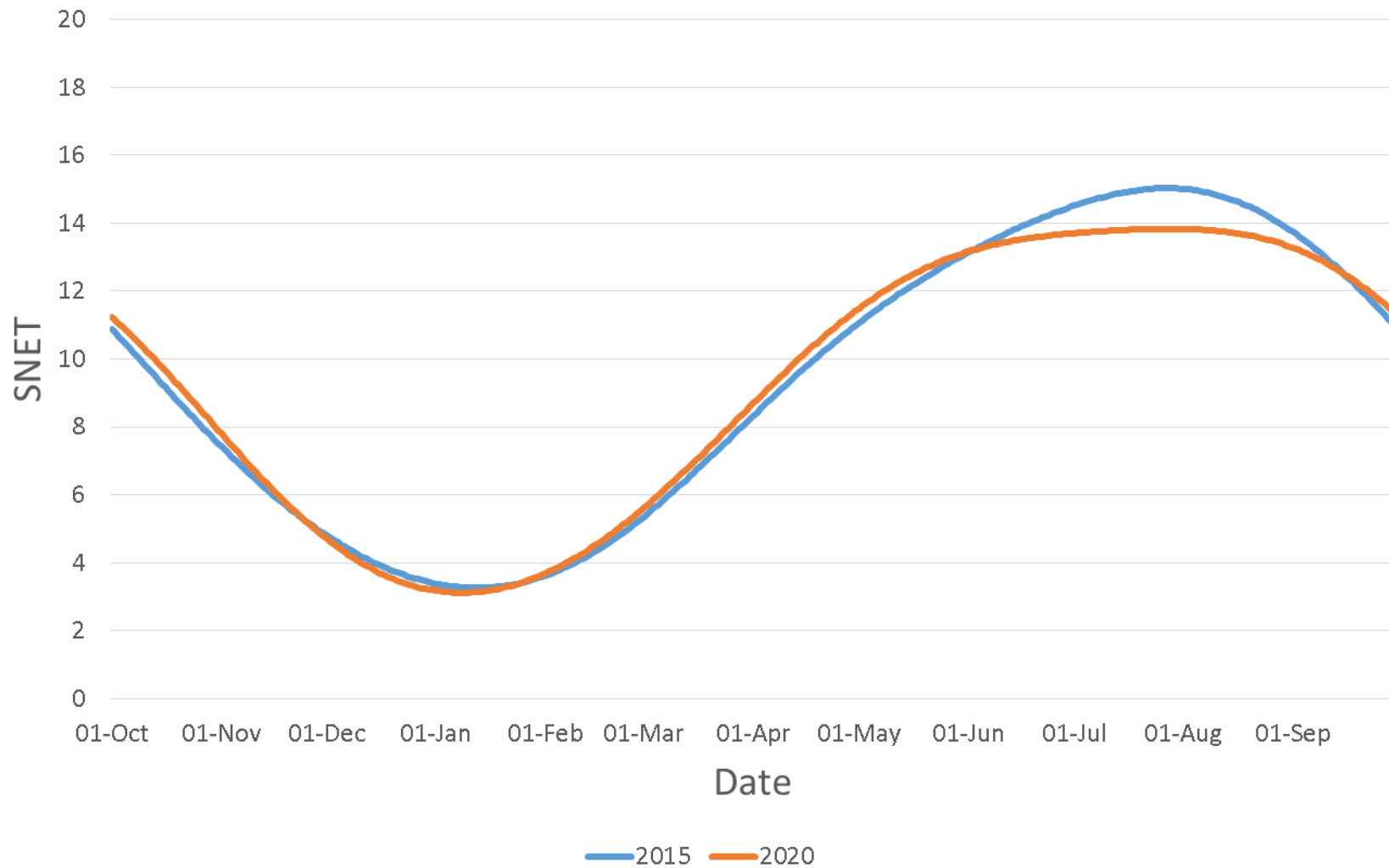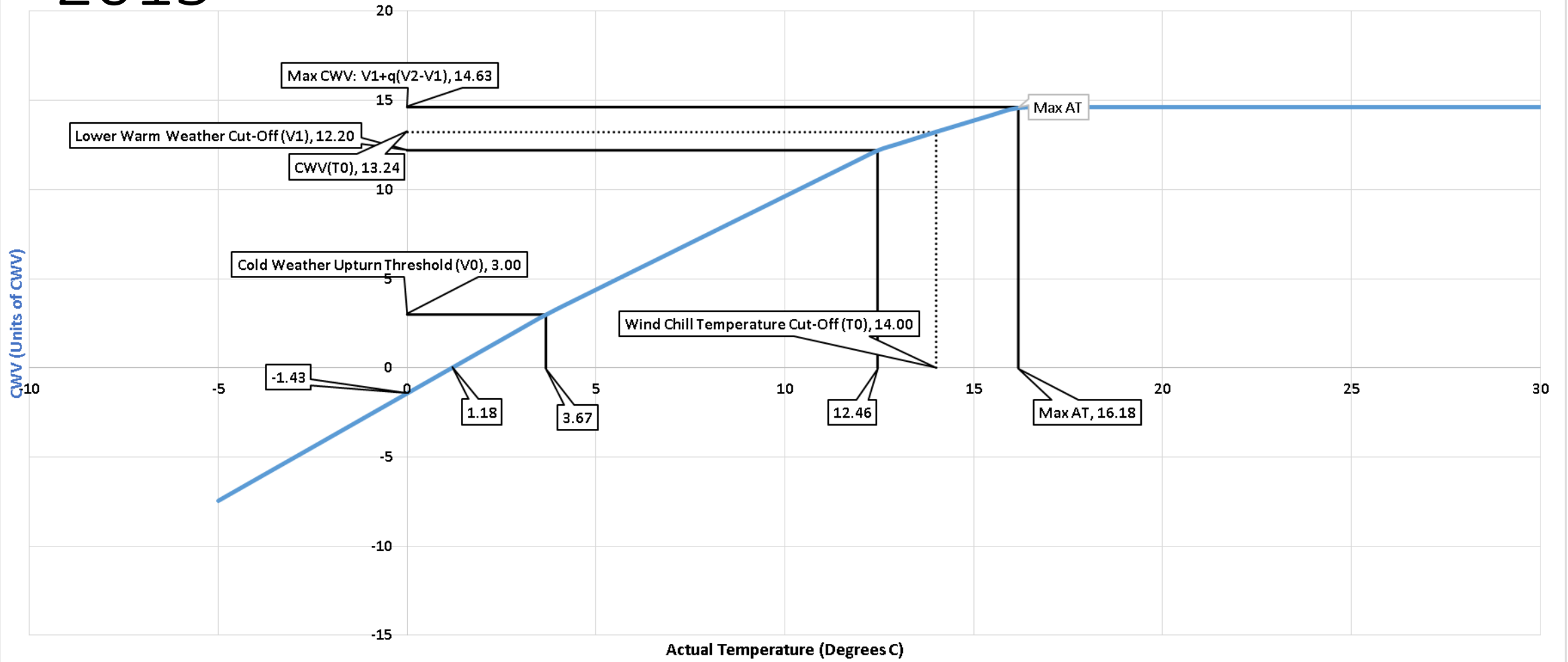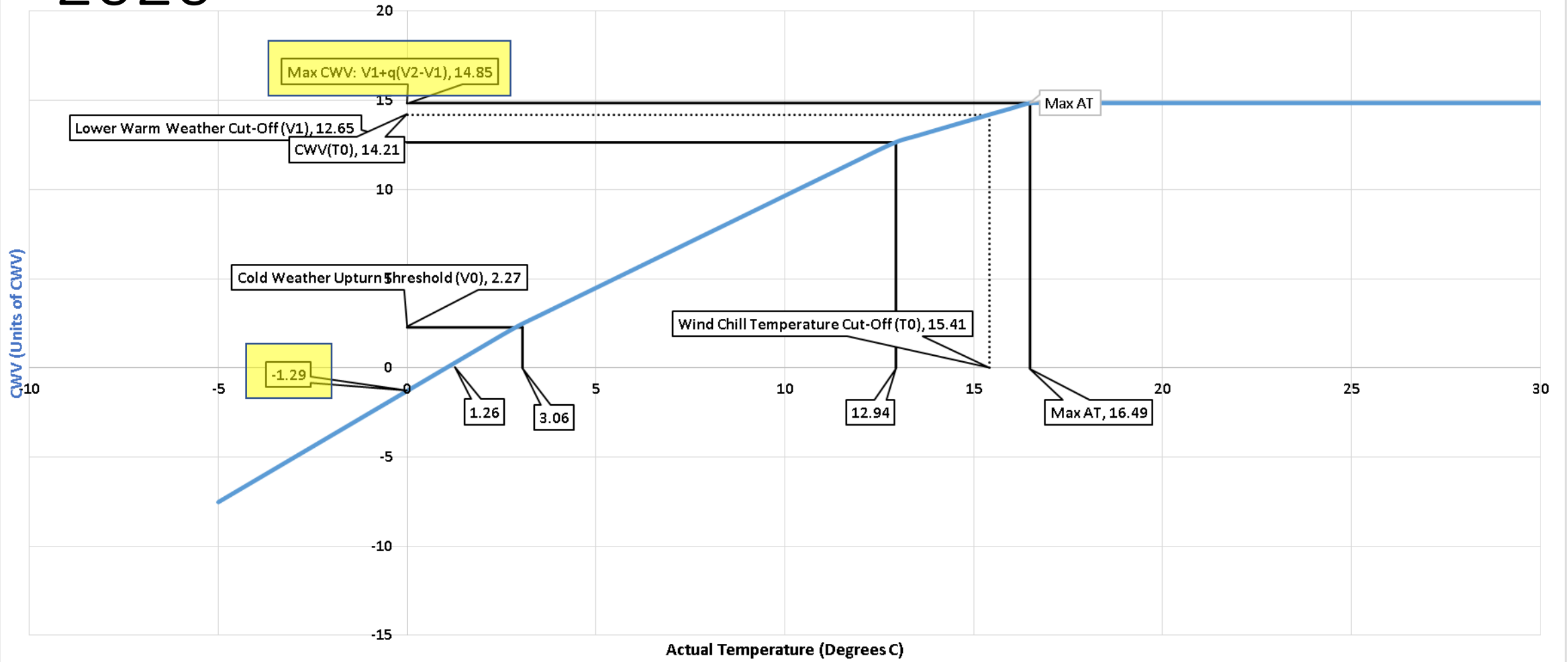
Results: LDZ SE

Parameter	2015	2020
Effective Temperature/AT Weight	0.500	0.483
Effective Temperature Weight (I1)	0.712	0.727
Wind Chill Weight (I2)	0.014	0.014
Cold Weather Sensitivity (I3)	0.33	0.325
Cold Weather Upturn Threshold (V0)	3	2.541
Lower Warm Weather Cut-Off (V1)	15.1	14.106
Upper Warm Weather Cut-Off (V2)	18.7	18.675
Slope Relating to Warm Weather Cut-Off (q)	0.38	0.448
Wind Chill Wind Cut-Off (W0)	0	-0.511
Wind Chill Temperature Cut-Off (T0)	14	13.985
R2	**0.9914**	**0.9915**

CWV Optimisation alone

CWV Optimisation

LDZ	Station
SE	Heathrow

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	5.20%
2020	5.44%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9914	8184	
0.9915	8049	

MAPE

Month	2015	2020
Jan	3.39%	3.41%
Feb	3.17%	3.11%
Mar	4.66%	4.30%
Apr	6.71%	6.31%
May	7.16%	7.30%
Jun	6.18%	6.65%
Jul	5.76%	6.73%
Aug	5.24%	6.88%
Sep	5.43%	6.40%
Oct	6.19%	6.03%
Nov	4.34%	4.01%
Dec	4.02%	3.90%
All	5.20%	5.44%

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	3.54%	6.17%	5.73%	5.33%
2020	3.49%	5.97%	6.77%	5.48%
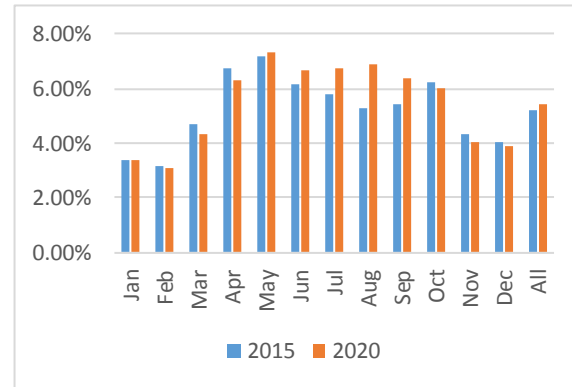
RMSE

Month	2015	2020
Jan	9724	9798
Feb	9204	9092
Mar	11262	10565
Apr	11040	10574
May	7750	7676
Jun	4680	4714
Jul	4021	4369
Aug	2738	3747
Sep	4238	4750
Oct	7559	7511
Nov	9099	8546
Dec	10638	10481
All	8184	8049

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	10034	10135	3888	7015
2020	9978	9691	4290	7123
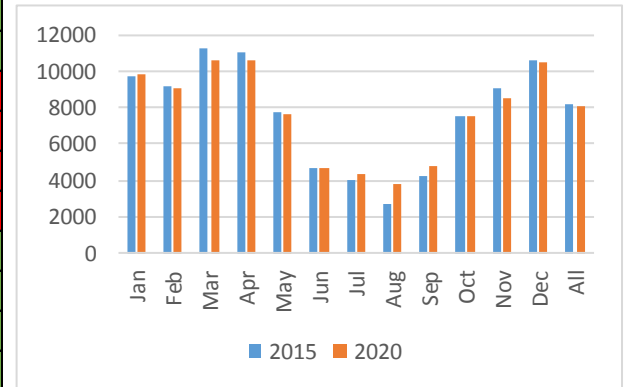
Plus Revised Temperature and Wind Weights

LDZ	Station
SE	Heathrow

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	5.20%
2020	5.62%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9914	8184	
0.9916	8022	

MAPE

Month	2015	2020
Jan	3.39%	3.54%
Feb	3.17%	3.10%
Mar	4.66%	4.19%
Apr	6.71%	5.99%
May	7.16%	6.99%
Jun	6.18%	6.36%
Jul	5.76%	8.53%
Aug	5.24%	8.16%
Sep	5.43%	6.35%
Oct	6.19%	5.84%
Nov	4.34%	4.05%
Dec	4.02%	4.02%
All	5.20%	5.62%
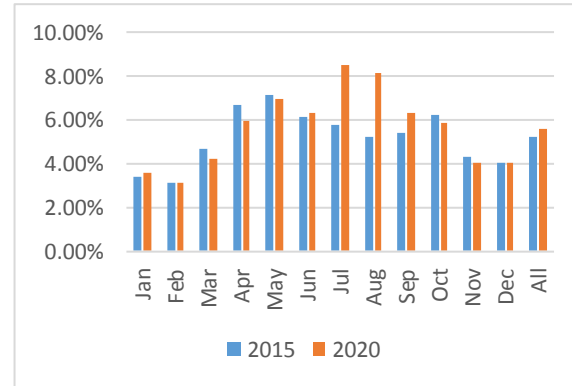
		Season		
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	3.54%	6.17%	5.73%	5.33%
2020	3.57%	5.72%	7.71%	5.42%

RMSE

Month	2015	2020
Jan	9724	10145
Feb	9204	9028
Mar	11262	10074
Apr	11040	10093
May	7750	7452
Jun	4680	4642
Jul	4021	4894
Aug	2738	4085
Sep	4238	4829
Oct	7559	7330
Nov	9099	8634
Dec	10638	10751
All	8184	8022
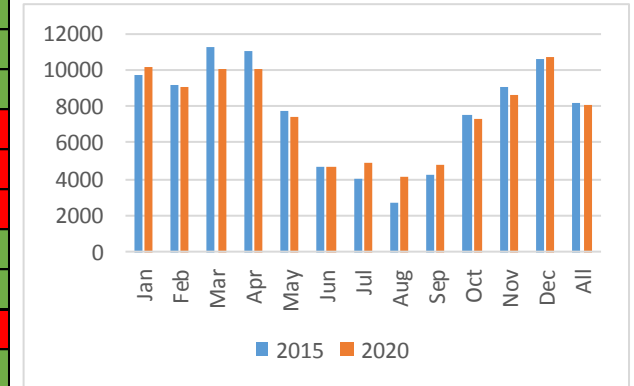
		Season		
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	10034	10135	3888	6986
2020	10181	9280	4552	7111

2020

Fixed Wind Speed

— 4.00

CWV (Units of CWV)

Actual Temperature (Degrees C)

Max CWV: V1+q(V2-V1), 16.15

Lower Warm Weather Cut-Off (V1), 14.11

CWV(T0), 13.85

Max AT

Cold Weather Upturn Threshold (V0), 2.54

Wind Chill Temperature Cut-Off (T0), 13.99

-2.20

1.48

3.29

14.24

Max AT, 18.81
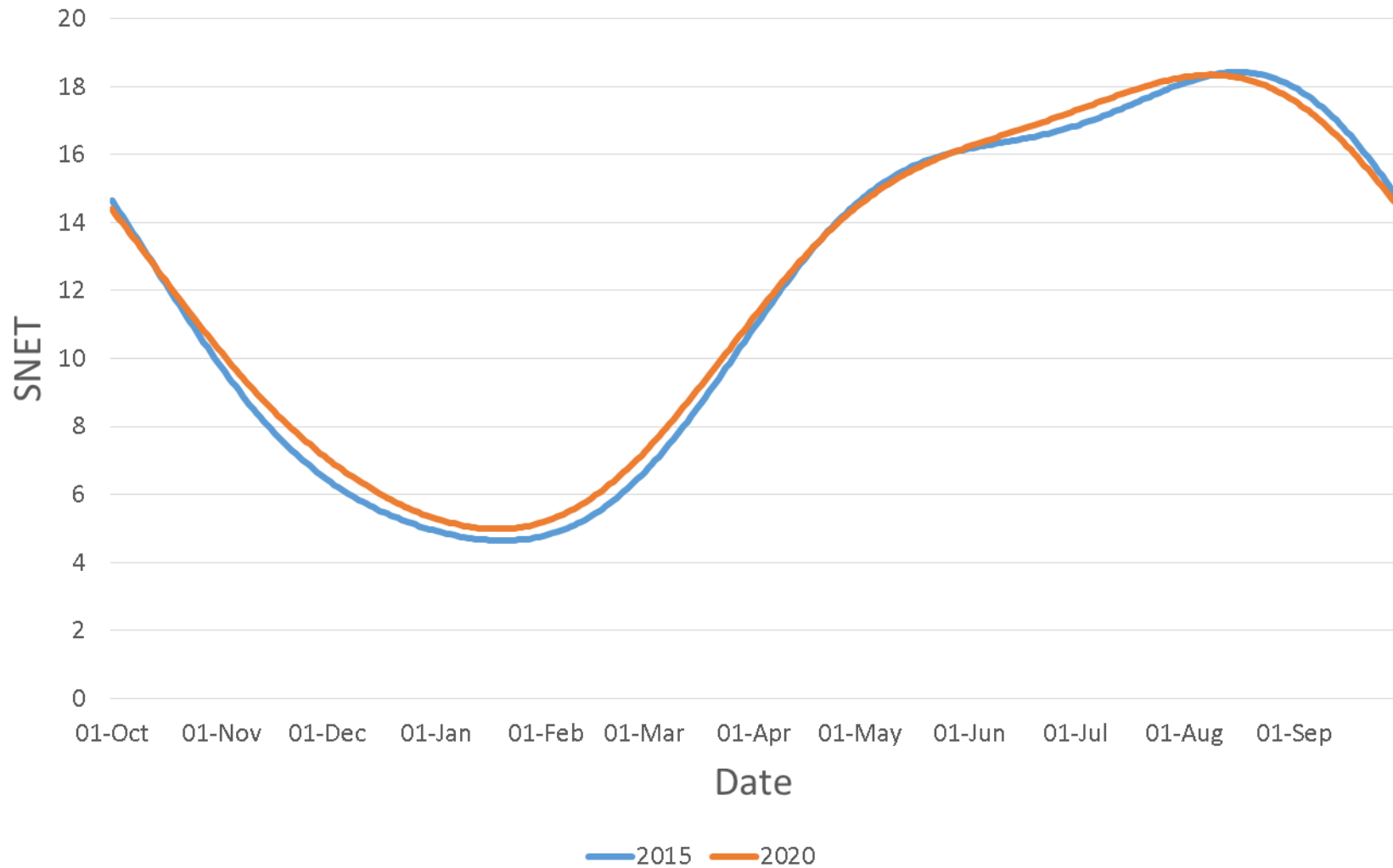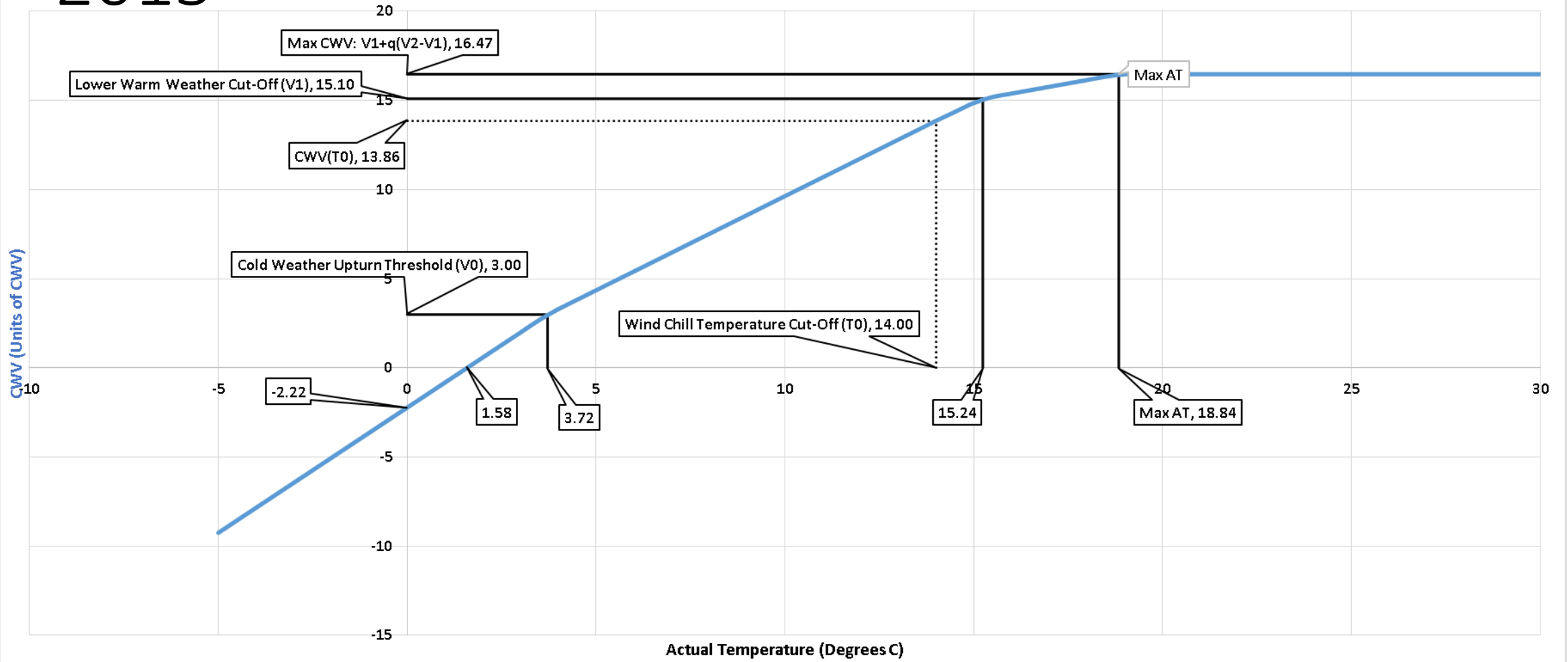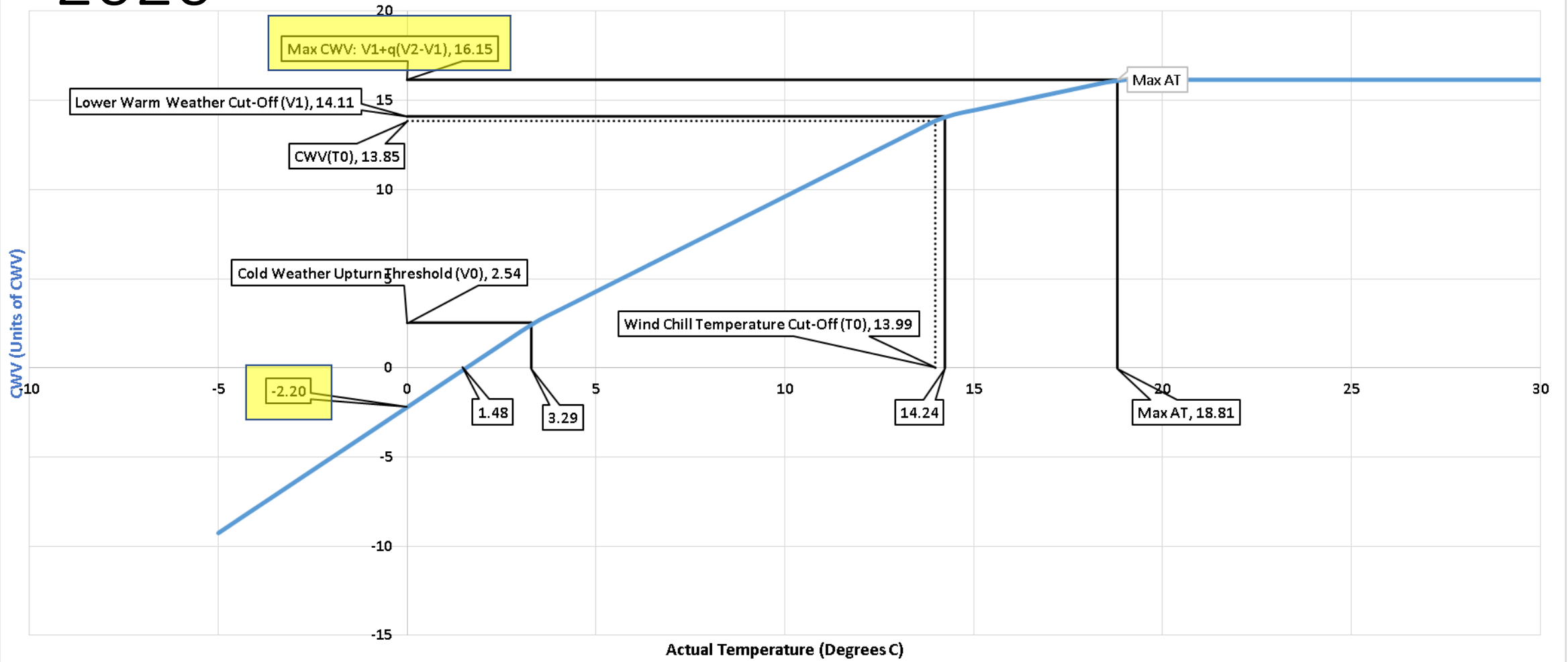
Results: LDZ SO

Parameter	2015	2020
Effective Temperature/AT Weight	0.500	0.430
Effective Temperature Weight (I1)	0.72	0.728
Wind Chill Weight (I2)	0.0134	0.013
Cold Weather Sensitivity (I3)	0.24	0.241
Cold Weather Upturn Threshold (V0)	3	2.853
Lower Warm Weather Cut-Off (V1)	14.8	12.210
Upper Warm Weather Cut-Off (V2)	18.2	17.600
Slope Relating to Warm Weather Cut-Off (q)	0.37	0.603
Wind Chill Wind Cut-Off (W0)	0	-1.309
Wind Chill Temperature Cut-Off (T0)	14	14.696
R2	**0.9916**	**0.9908**

CWV Optimisation alone

CWV Optimisation

LDZ	Station
SO	Southampton Oceanographic Ce

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error		Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
2015	5.60%		0.9916	5956	
2020	6.51%		0.9908	5939	

MAPE

Month	2015	2020
Jan	3.83%	3.42%
Feb	3.42%	3.26%
Mar	5.20%	4.81%
Apr	6.85%	6.72%
May	7.17%	9.76%
Jun	5.06%	8.39%
Jul	9.44%	11.87%
Aug	4.96%	6.97%
Sep	5.60%	7.08%
Oct	6.08%	6.19%
Nov	4.41%	5.20%
Dec	4.91%	4.17%
All	5.60%	6.51%

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.07%	6.40%	6.50%	5.37%
2020	3.63%	7.10%	9.09%	6.16%

RMSE
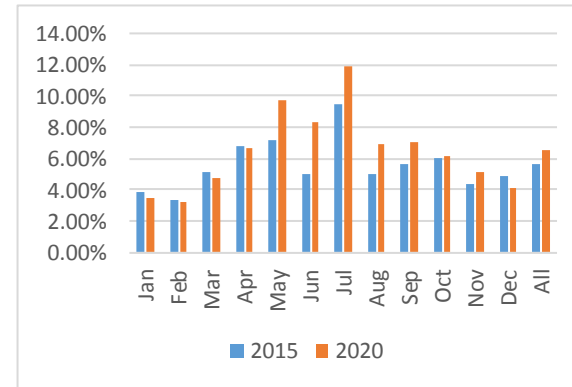
Month	2015	2020
Jan	7452	6847
Feb	6858	6455
Mar	8618	7528
Apr	7482	7385
May	5236	6368
Jun	2864	3899
Jul	2553	3148
Aug	1777	2538
Sep	3031	3619
Oct	5087	5324
Nov	6235	7296
Dec	8587	7557
All	5956	5939

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	7733	7247	2436	5498
2020	7016	7110	3235	5614

Plus Revised Temperature and Wind Weights

LDZ	Station
SO	Southampton Oceanographic Ce

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	5.60%
2020	6.41%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9916	5956	
0.9909	5933	

MAPE

Month	2015	2020
Jan	3.83%	3.53%
Feb	3.42%	3.30%
Mar	5.20%	4.94%
Apr	6.85%	6.38%
May	7.17%	9.11%
Jun	5.06%	7.63%
Jul	9.44%	13.16%
Aug	4.96%	6.84%
Sep	5.60%	6.35%
Oct	6.08%	5.80%
Nov	4.41%	5.25%
Dec	4.91%	4.31%
All	5.60%	6.41%
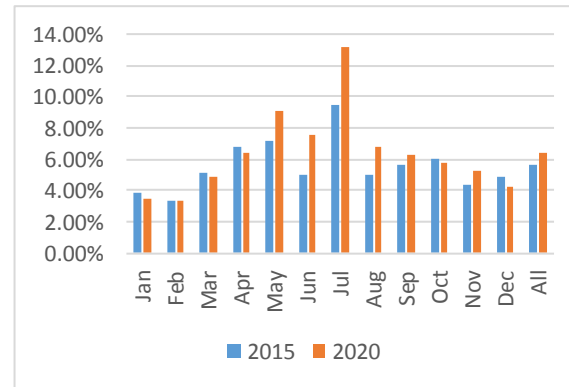
		Season		
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.07%	6.40%	6.50%	5.37%
2020	3.73%	6.81%	9.23%	5.80%

RMSE

Month	2015	2020
Jan	7452	7089
Feb	6858	6516
Mar	8618	7613
Apr	7482	7107
May	5236	6102
Jun	2864	3459
Jul	2553	3432
Aug	1777	2448
Sep	3031	3295
Oct	5087	5066
Nov	6235	7494
Dec	8587	7866
All	5956	5933
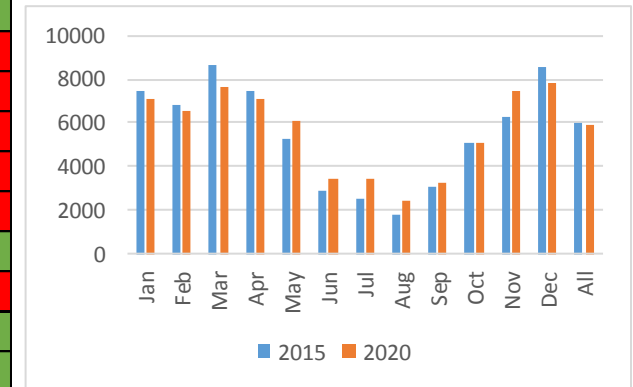
		Season		
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	7733	7247	2436	5503
2020	7230	6968	3145	5553
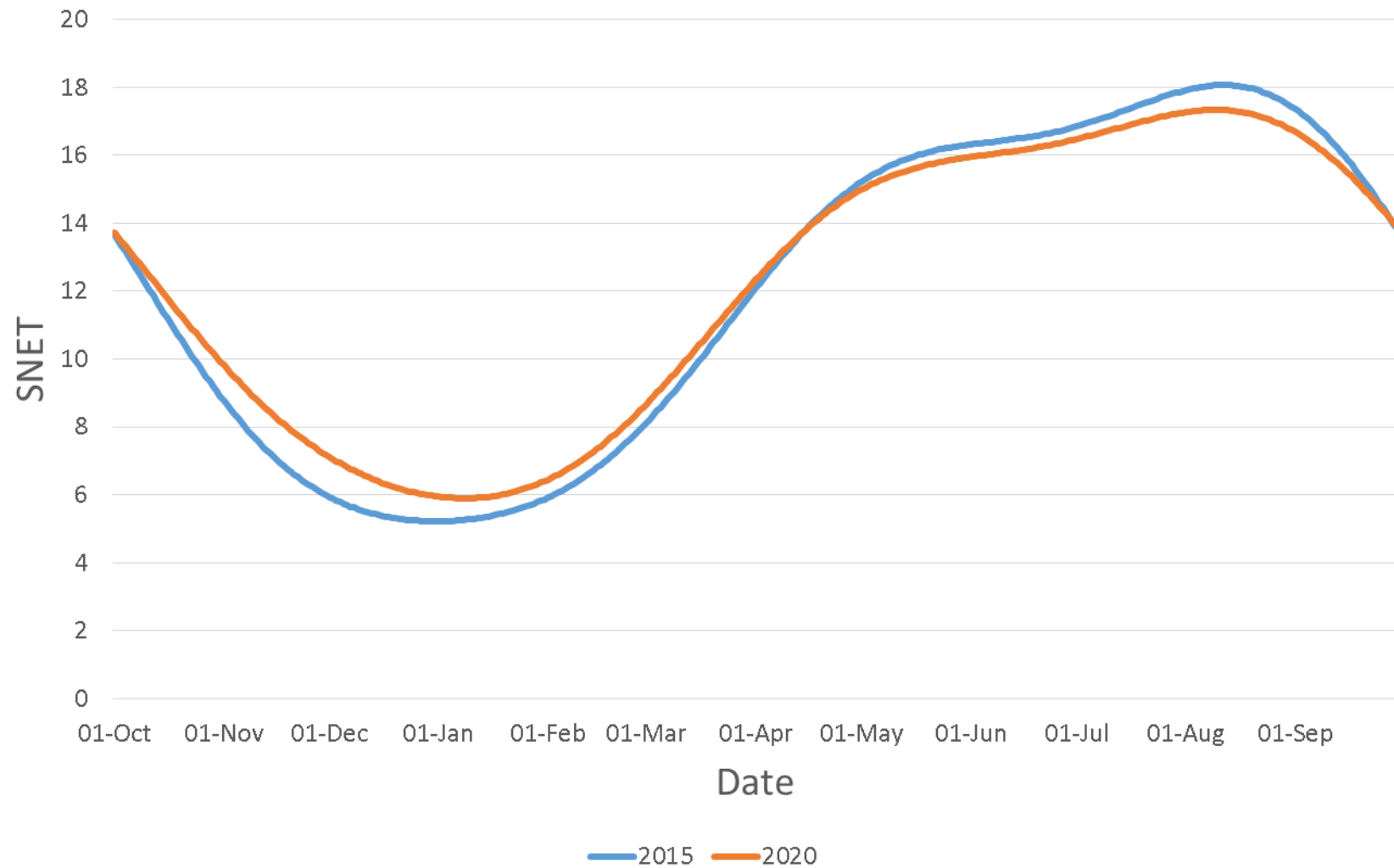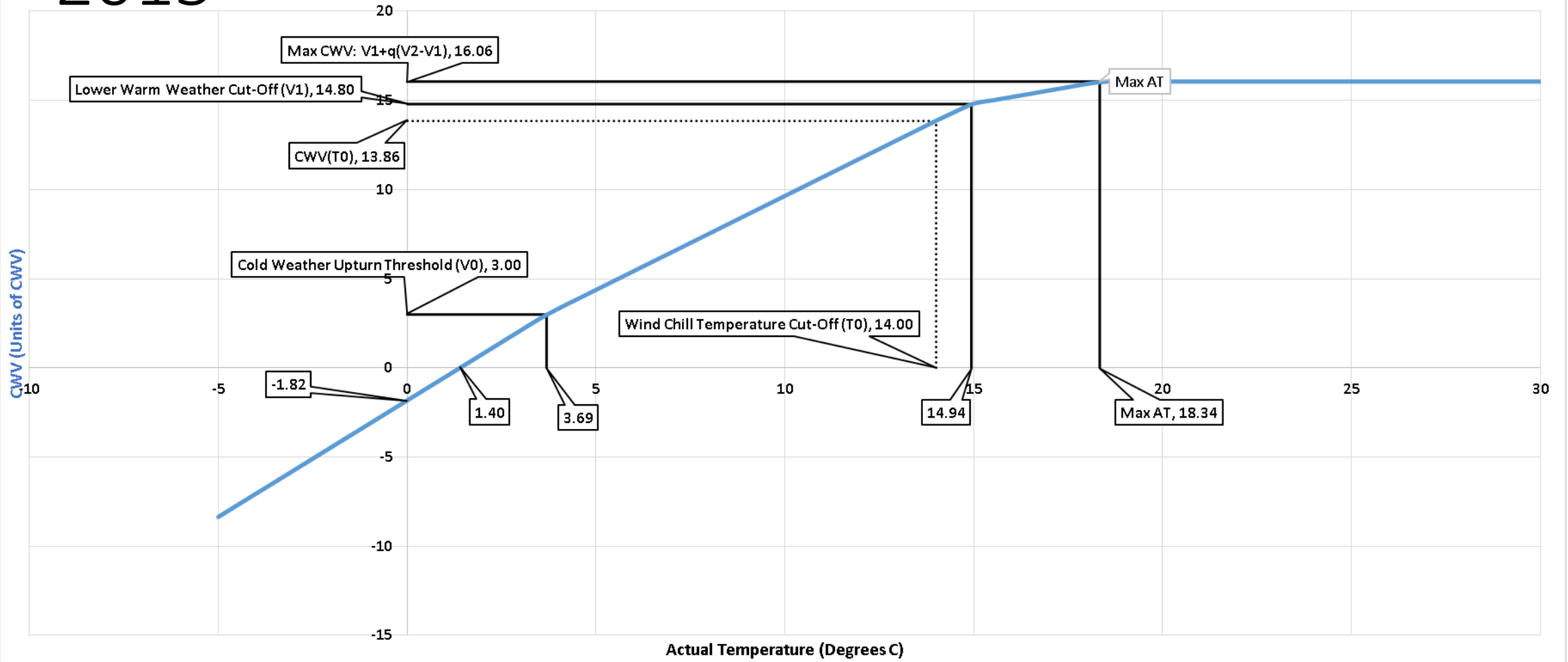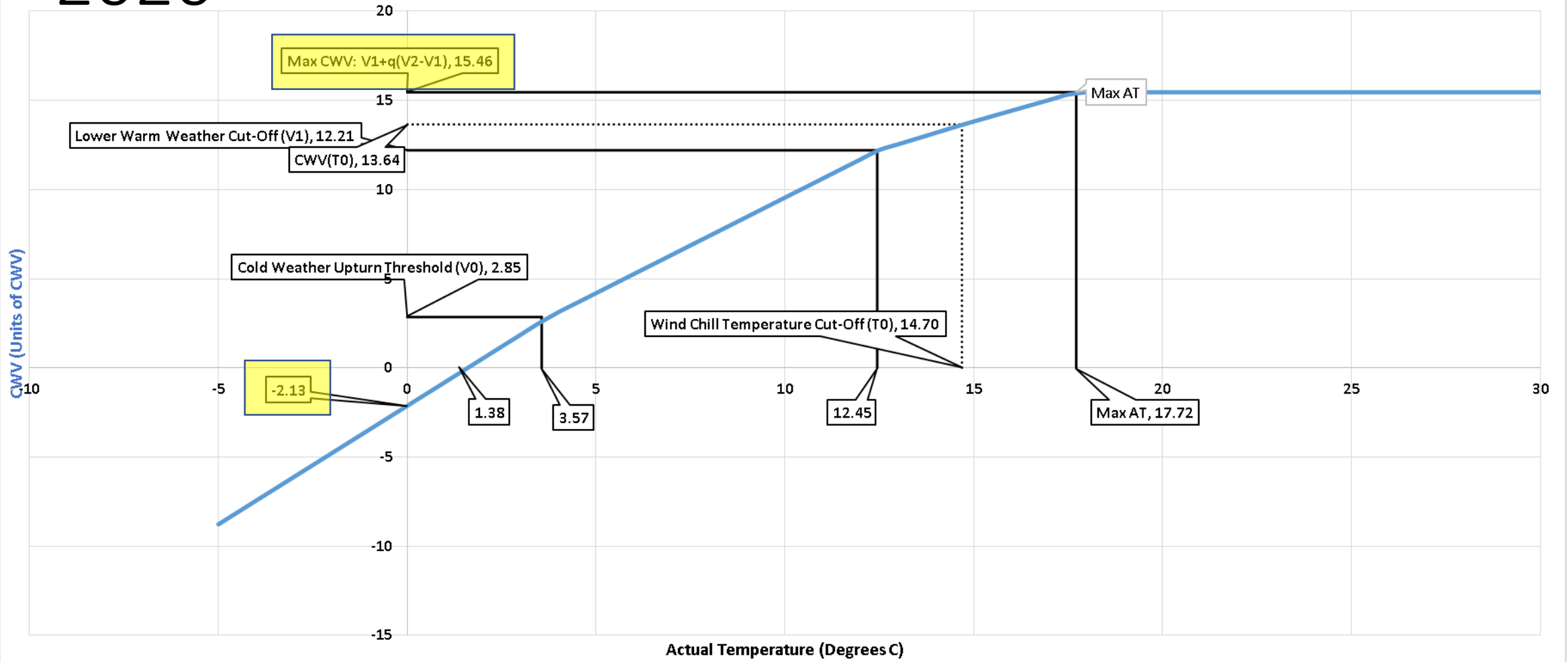
Results: LDZ SW

Parameter	2015	2020
Effective Temperature/AT Weight	0.500	0.547
Effective Temperature Weight (I1)	0.682	0.613
Wind Chill Weight (I2)	0.010	0.014
Cold Weather Sensitivity (I3)	0.220	0.417
Cold Weather Upturn Threshold (V0)	3.000	2.457
Lower Warm Weather Cut-Off (V1)	14.200	13.607
Upper Warm Weather Cut-Off (V2)	17.300	18.228
Slope Relating to Warm Weather Cut-Off (q)	0.420	0.416
Wind Chill Wind Cut-Off (W0)	0.000	1.286
Wind Chill Temperature Cut-Off (T0)	14.000	15.792
R2	**0.9902**	**0.9877**

CWV Optimisation alone

CWV Optimisation

LDZ	Station
SW	Yeolvilton

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	5.99%
2020	6.91%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9902	5125	
0.9877	5630	

MAPE

Month	2015	2020
Jan	3.82%	4.13%
Feb	3.76%	3.83%
Mar	5.29%	6.24%
Apr	8.02%	9.67%
May	8.40%	9.04%
Jun	6.58%	7.71%
Jul	6.48%	8.89%
Aug	6.26%	8.09%
Sep	6.70%	8.07%
Oct	6.88%	7.39%
Nov	4.71%	4.90%
Dec	4.87%	4.70%
All	5.99%	6.91%
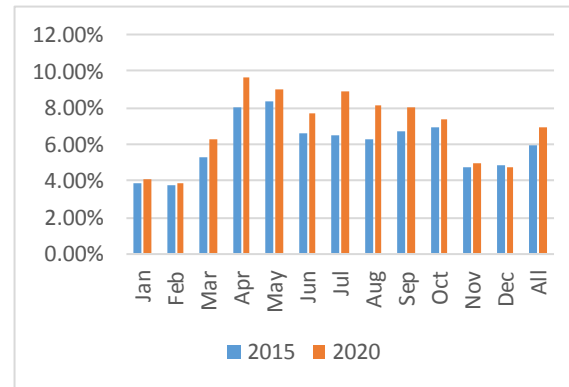
Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.16%	7.23%	6.44%	6.11%
2020	4.24%	8.30%	8.24%	6.79%

RMSE

Month	2015	2020
Jan	5971	6402
Feb	6131	6356
Mar	7025	7848
Apr	7060	7981
May	4862	5508
Jun	2599	3111
Jul	1910	2586
Aug	1879	2437
Sep	2802	3326
Oct	4538	4866
Nov	5399	5815
Dec	6947	7289
All	5125	5630

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	6410	6391	2150	4670
2020	6732	7194	2722	4781
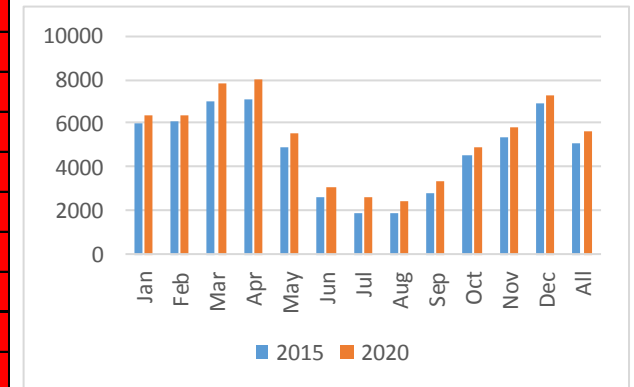
Plus Revised Temperature and Wind Weights

LDZ	Station
SW	Yeolvilton

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	5.99%
2020	6.34%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9902	5125	
0.9890	5445	

MAPE

Month	2015	2020
Jan	3.82%	4.24%
Feb	3.76%	3.85%
Mar	5.29%	5.84%
Apr	8.02%	8.39%
May	8.40%	8.09%
Jun	6.58%	7.28%
Jul	6.48%	7.34%
Aug	6.26%	7.59%
Sep	6.70%	7.01%
Oct	6.88%	6.44%
Nov	4.71%	4.81%
Dec	4.87%	4.98%
All	5.99%	6.34%
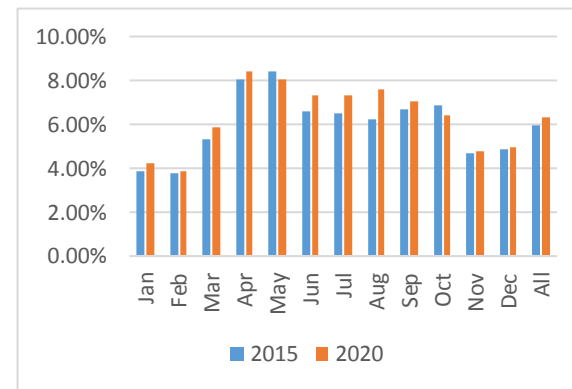
		Season		
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.16%	7.23%	6.44%	6.11%
2020	4.37%	7.43%	7.40%	6.09%

RMSE

Month	2015	2020
Jan	5971	6650
Feb	6131	6391
Mar	7025	7466
Apr	7060	7242
May	4862	5167
Jun	2599	3021
Jul	1910	2126
Aug	1879	2258
Sep	2802	2793
Oct	4538	4358
Nov	5399	5748
Dec	6947	7606
All	5125	5445
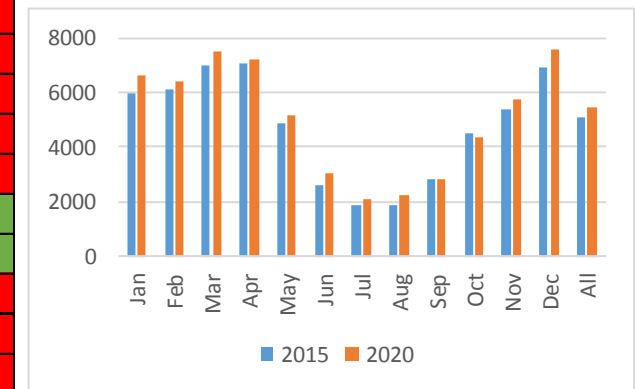
		Season		
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	6410	6391	2150	4467
2020	6946	6699	2493	4465

SW LDZ Pseudo SNET Profiles
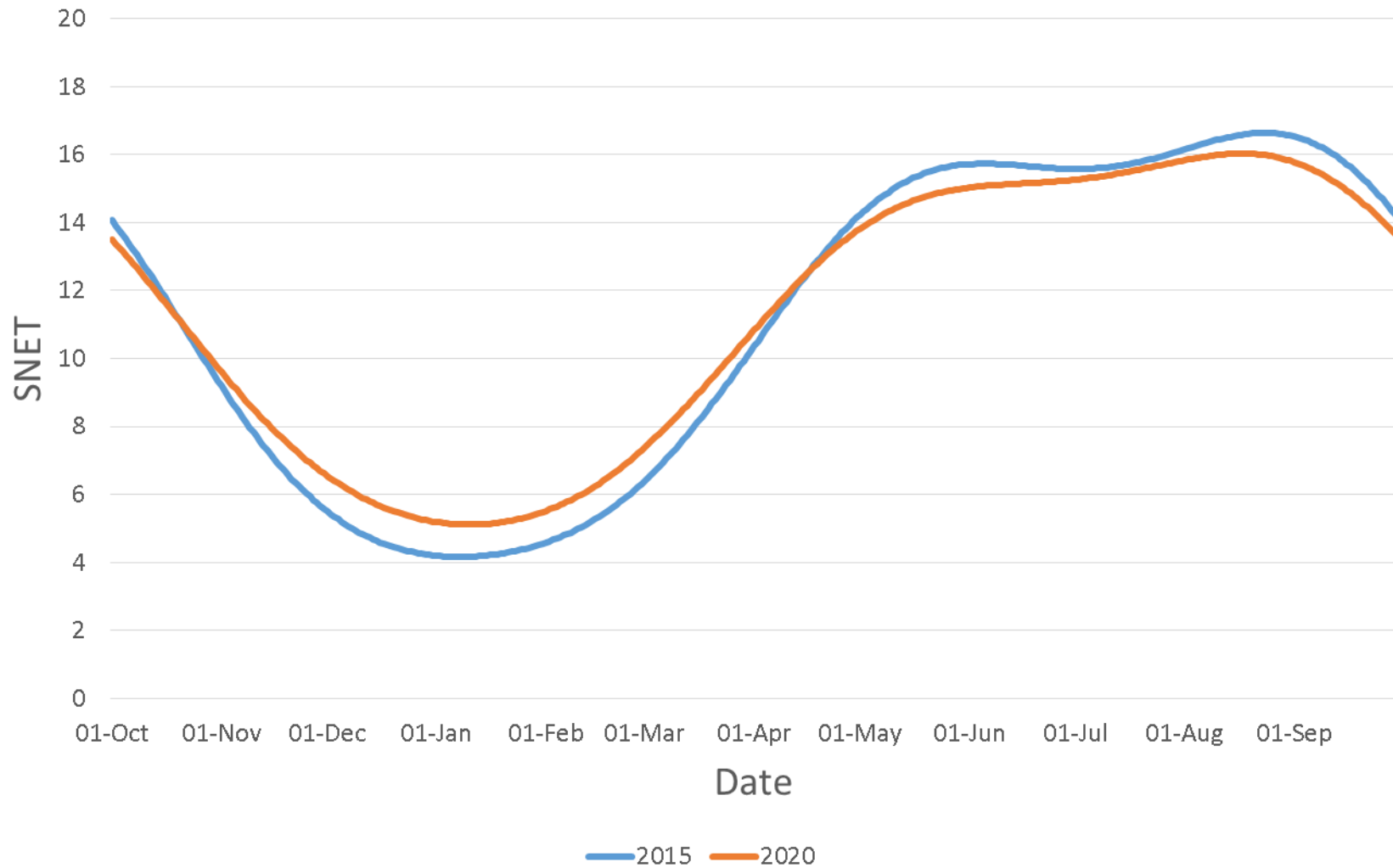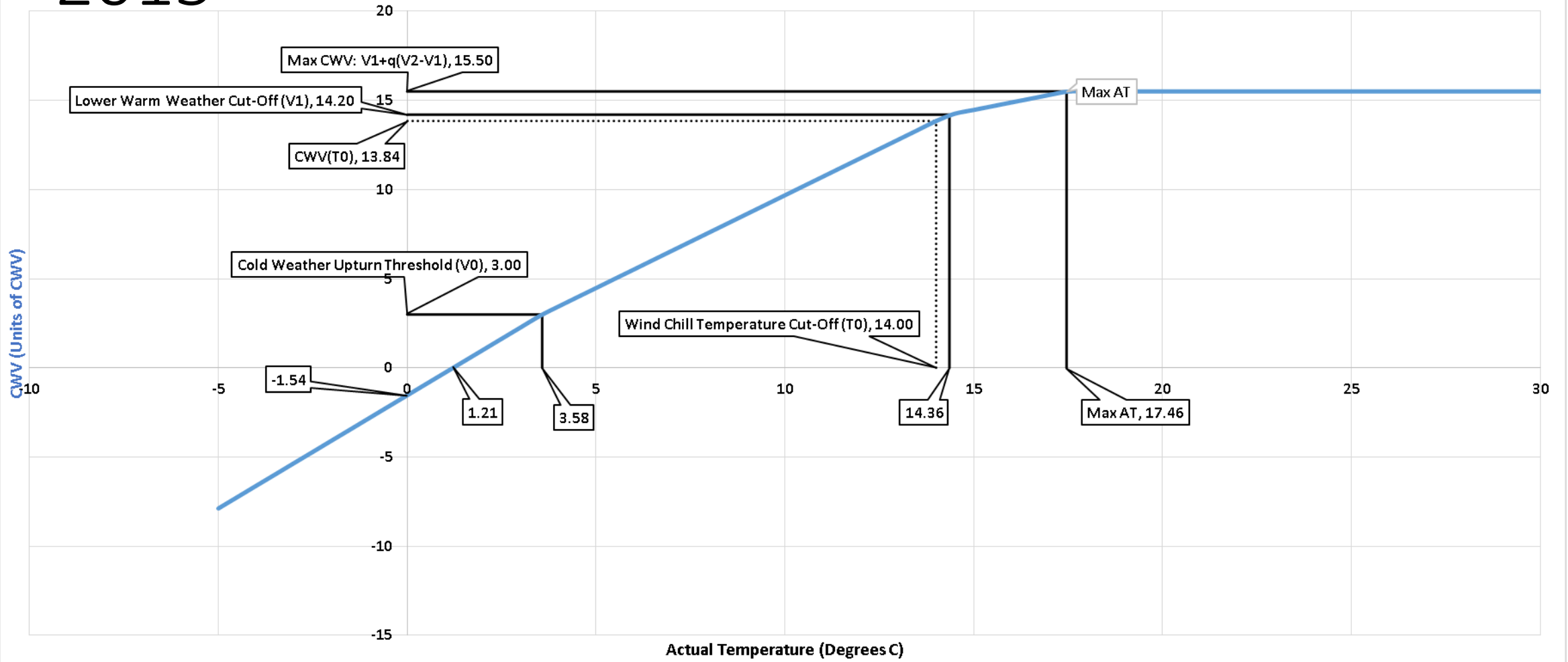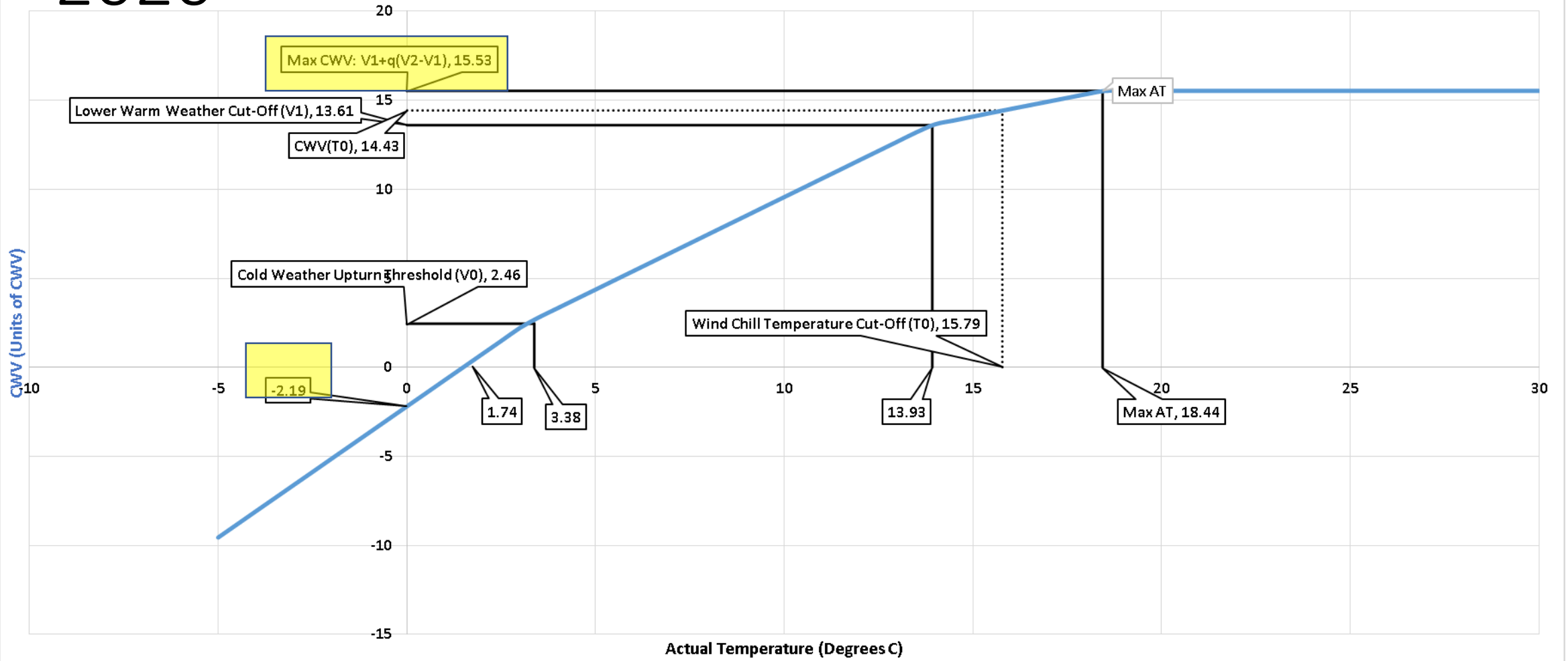
Results: LDZ WM

Parameter	2015	2020
Effective Temperature/AT Weight	0.500	0.467
Effective Temperature Weight (I1)	0.72	0.692
Wind Chill Weight (I2)	0.0111	0.012
Cold Weather Sensitivity (I3)	0.14	0.242
Cold Weather Upturn Threshold (V0)	3	2.264
Lower Warm Weather Cut-Off (V1)	13.7	13.367
Upper Warm Weather Cut-Off (V2)	17.2	18.292
Slope Relating to Warm Weather Cut-Off (q)	0.43	0.424
Wind Chill Wind Cut-Off (W0)	0	0.186
Wind Chill Temperature Cut-Off (T0)	14	16.029
R2	**0.9918**	**0.9922**

CWV Optimisation alone

CWV Optimisation

LDZ	Station
WM	Winterbourne

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error	Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
2015	6.55%	0.9918	8155	
2020	7.02%	0.9922	8221	

MAPE

Month	2015	2020
Jan	4.01%	3.91%
Feb	3.90%	3.78%
Mar	4.88%	4.69%
Apr	8.57%	8.39%
May	8.48%	8.65%
Jun	7.95%	8.66%
Jul	7.96%	10.92%
Aug	8.02%	9.93%
Sep	8.24%	8.22%
Oct	6.86%	7.04%
Nov	4.57%	4.53%
Dec	4.96%	5.29%
All	6.55%	7.02%
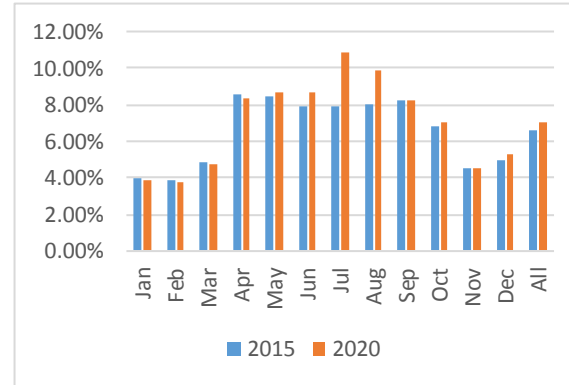
Season				
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.30%	7.29%	7.98%	6.56%
2020	4.34%	7.23%	9.85%	6.60%

RMSE

Month	2015	2020
Jan	9870	9726
Feb	9533	9333
Mar	9882	9446
Apr	11130	10786
May	7659	7647
Jun	4861	4954
Jul	3452	4560
Aug	3642	4462
Sep	5746	5582
Oct	7556	7479
Nov	8514	8555
Dec	10956	11871
All	8155	8221

Season				
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	10198	9647	4024	7353
2020	10429	9365	4660	7312
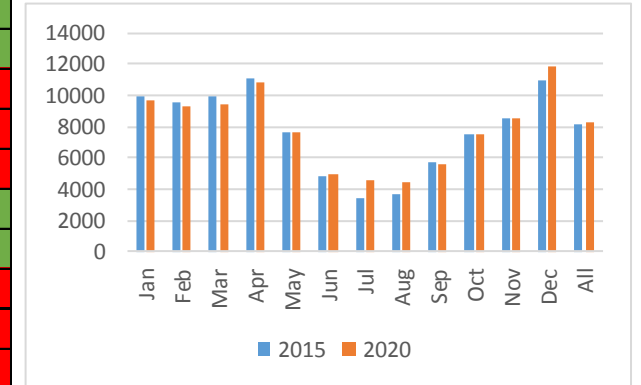
Plus Revised Temperature and Wind Weights

LDZ	Station
WM	Winterbourne

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	6.55%
2020	6.59%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9918	8155	
0.9926	7994	

MAPE

Month	2015	2020
Jan	4.01%	3.95%
Feb	3.90%	3.70%
Mar	4.88%	4.50%
Apr	8.57%	7.85%
May	8.48%	8.13%
Jun	7.95%	8.05%
Jul	7.96%	8.96%
Aug	8.02%	9.50%
Sep	8.24%	7.72%
Oct	6.86%	6.65%
Nov	4.57%	4.51%
Dec	4.96%	5.37%
All	6.55%	6.59%
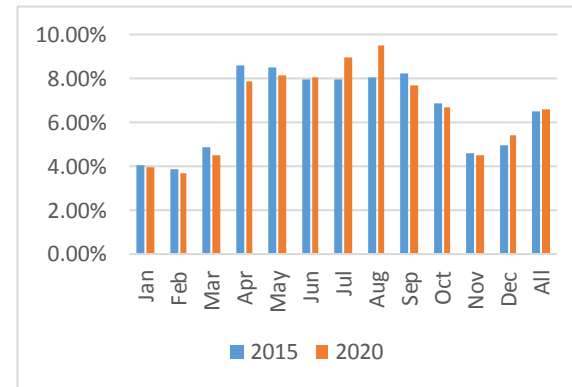
Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.30%	7.29%	7.98%	6.56%
2020	4.36%	6.82%	8.85%	6.30%

RMSE

Month	2015	2020
Jan	9870	9887
Feb	9533	9229
Mar	9882	9053
Apr	11130	10182
May	7659	7183
Jun	4861	4597
Jul	3452	3810
Aug	3642	4266
Sep	5746	5125
Oct	7556	7140
Nov	8514	8599
Dec	10956	11947
All	8155	7994
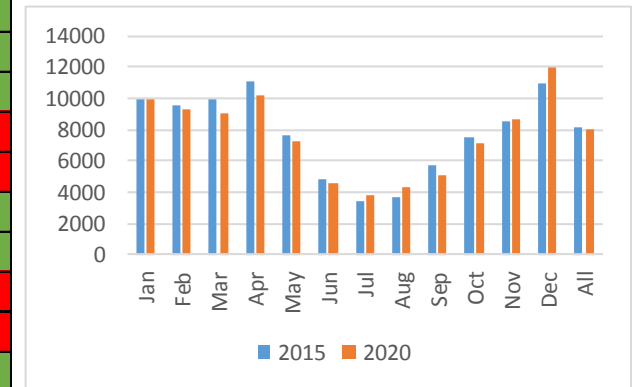
Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	10198	9647	4024	7254
2020	10476	8877	4232	7099

WM LDZ Pseudo SNET Profiles

2015

Fixed Wind Speed

4.00

CWV (Units of CWV)

Actual Temperature (Degrees C)

Max CWV: V1+q(V2-V1), 15.21

Lower Warm Weather Cut-Off (V1), 13.70

CWV(T0), 13.77

Cold Weather Upturn Threshold (V0), 3.00

Wind Chill Temperature Cut-Off (T0), 14.00

Max AT

-1.29

1.08

3.60

13.85

Max AT, 17.34
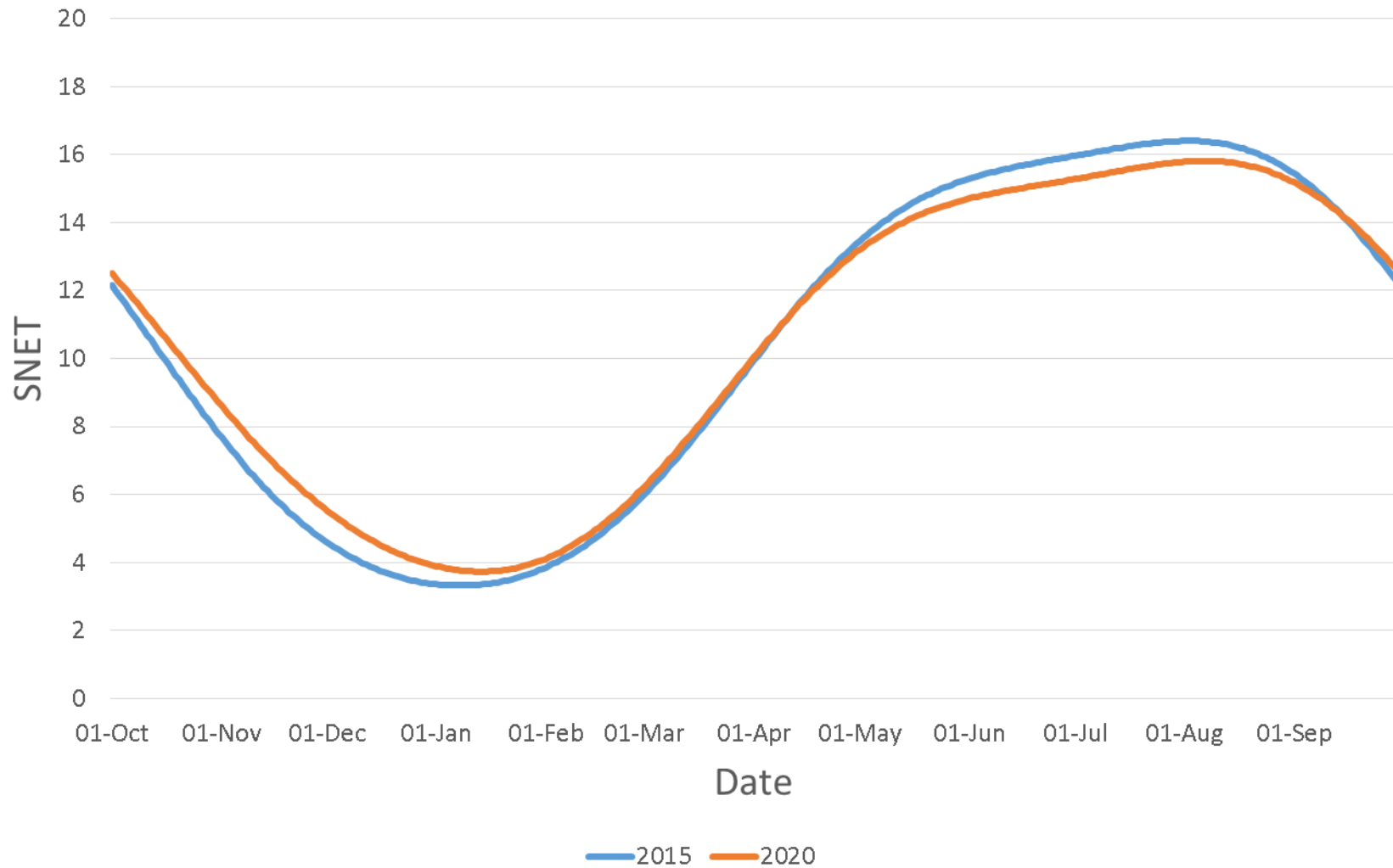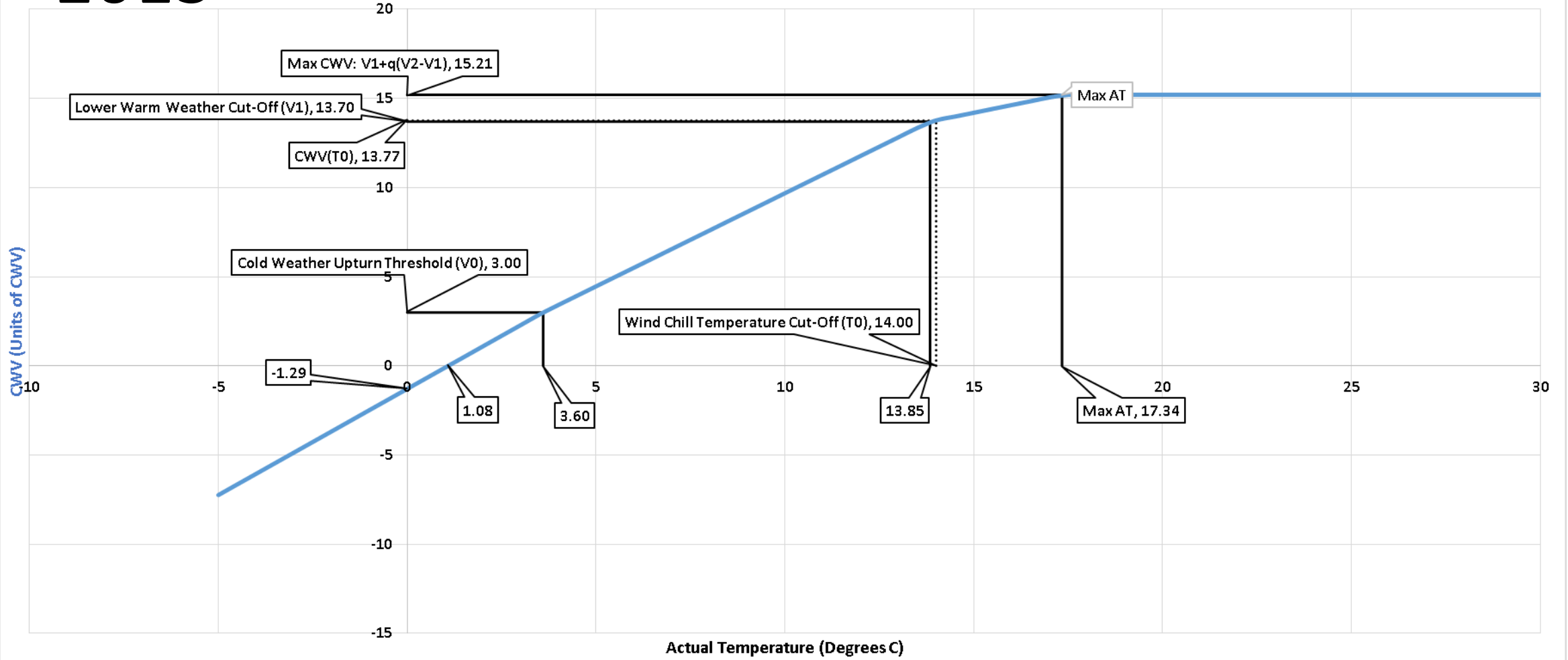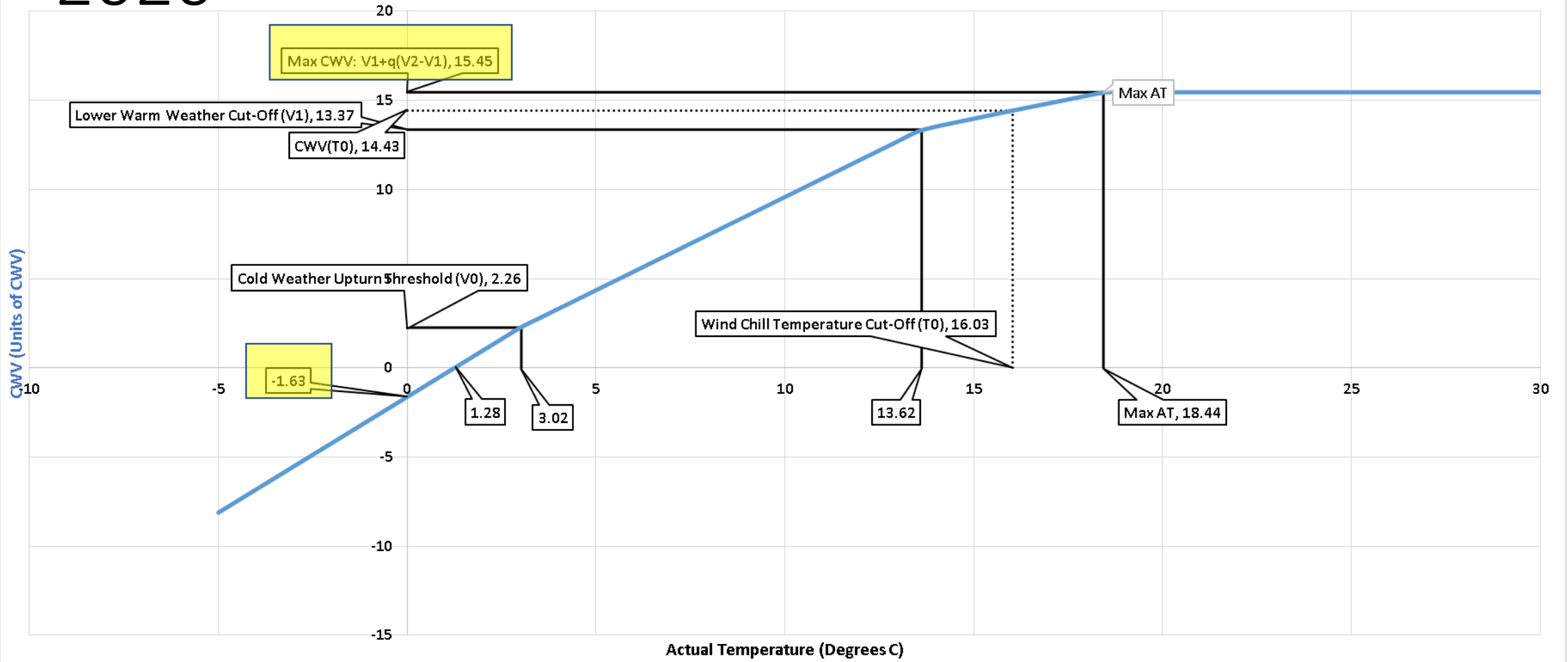
Results: LDZ WN

Parameter	2015	2020
Effective Temperature/AT Weight	0.500	0.494
Effective Temperature Weight (I1)	0.697	0.605
Wind Chill Weight (I2)	0.0149	0.017
Cold Weather Sensitivity (I3)	0.3	0.308
Cold Weather Upturn Threshold (V0)	3	2.435
Lower Warm Weather Cut-Off (V1)	14.9	13.602
Upper Warm Weather Cut-Off (V2)	18	19.761
Slope Relating to Warm Weather Cut-Off (q)	0.38	0.389
Wind Chill Wind Cut-Off (W0)	0	0.176
Wind Chill Temperature Cut-Off (T0)	14	12.671
R2	**0.9835**	**0.9843**

CWV Optimisation alone

CWV Optimisation

LDZ	Station
WN	hester Rostherne

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	7.39%
2020	7.25%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9835	1104	
0.9843	1092	

MAPE

Month	2015	2020
Jan	4.20%	4.18%
Feb	4.46%	4.51%
Mar	5.18%	5.25%
Apr	8.79%	8.79%
May	10.92%	9.72%
Jun	9.08%	9.26%
Jul	8.11%	9.18%
Aug	9.06%	10.13%
Sep	10.80%	8.58%
Oct	7.76%	7.41%
Nov	4.97%	4.69%
Dec	5.15%	5.14%
All	7.39%	7.25%
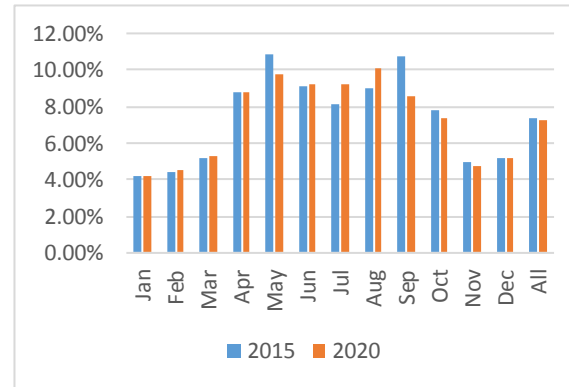
Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.61%	8.29%	8.75%	7.84%
2020	4.61%	7.91%	9.53%	6.90%

RMSE

Month	2015	2020
Jan	1289	1285
Feb	1288	1332
Mar	1245	1213
Apr	1478	1489
May	1180	1152
Jun	707	711
Jul	497	534
Aug	571	586
Sep	909	775
Oct	1067	1033
Nov	1107	1076
Dec	1399	1402
All	1104	1092

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	1331	1305	597	1009
2020	1344	1291	614	971
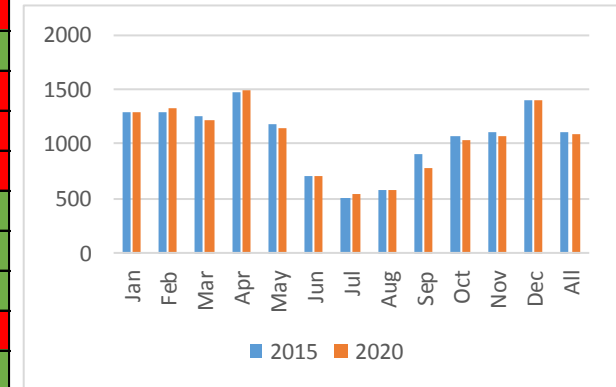
Plus Revised Temperature and Wind Weights

LDZ	Station
WN	Manchester Rostherne

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	7.39%
2020	7.17%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9835	1104	
0.9846	1080	

MAPE

Month	2015	2020
Jan	4.20%	4.20%
Feb	4.46%	4.55%
Mar	5.18%	5.12%
Apr	8.79%	8.24%
May	10.92%	9.41%
Jun	9.08%	9.22%
Jul	8.11%	9.22%
Aug	9.06%	10.40%
Sep	10.80%	8.39%
Oct	7.76%	7.16%
Nov	4.97%	4.66%
Dec	5.15%	5.27%
All	7.39%	7.17%
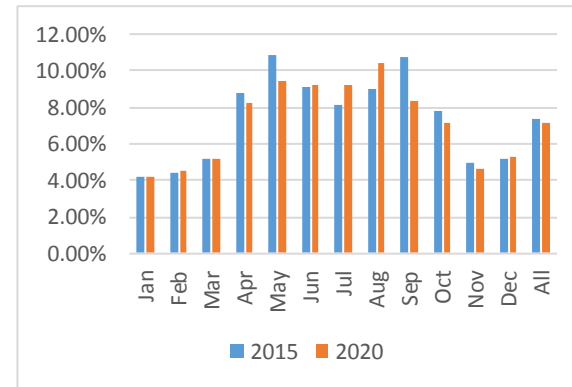
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.61%	8.29%	8.75%	7.84%
2020	4.68%	7.59%	9.62%	6.74%

RMSE

Month	2015	2020
Jan	1289	1288
Feb	1288	1361
Mar	1245	1185
Apr	1478	1421
May	1180	1126
Jun	707	693
Jul	497	536
Aug	571	603
Sep	909	748
Oct	1067	985
Nov	1107	1079
Dec	1399	1426
All	1104	1080
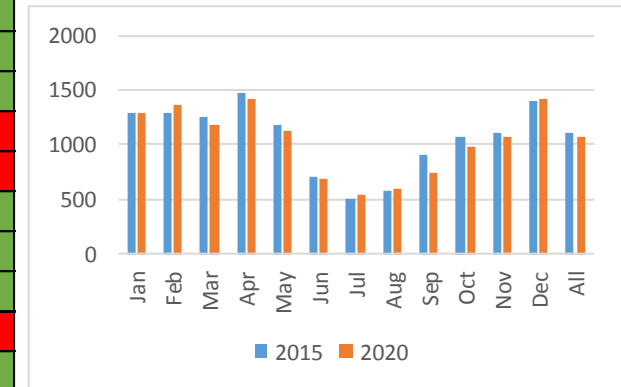
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	1331	1305	597	993
2020	1362	1248	613	948
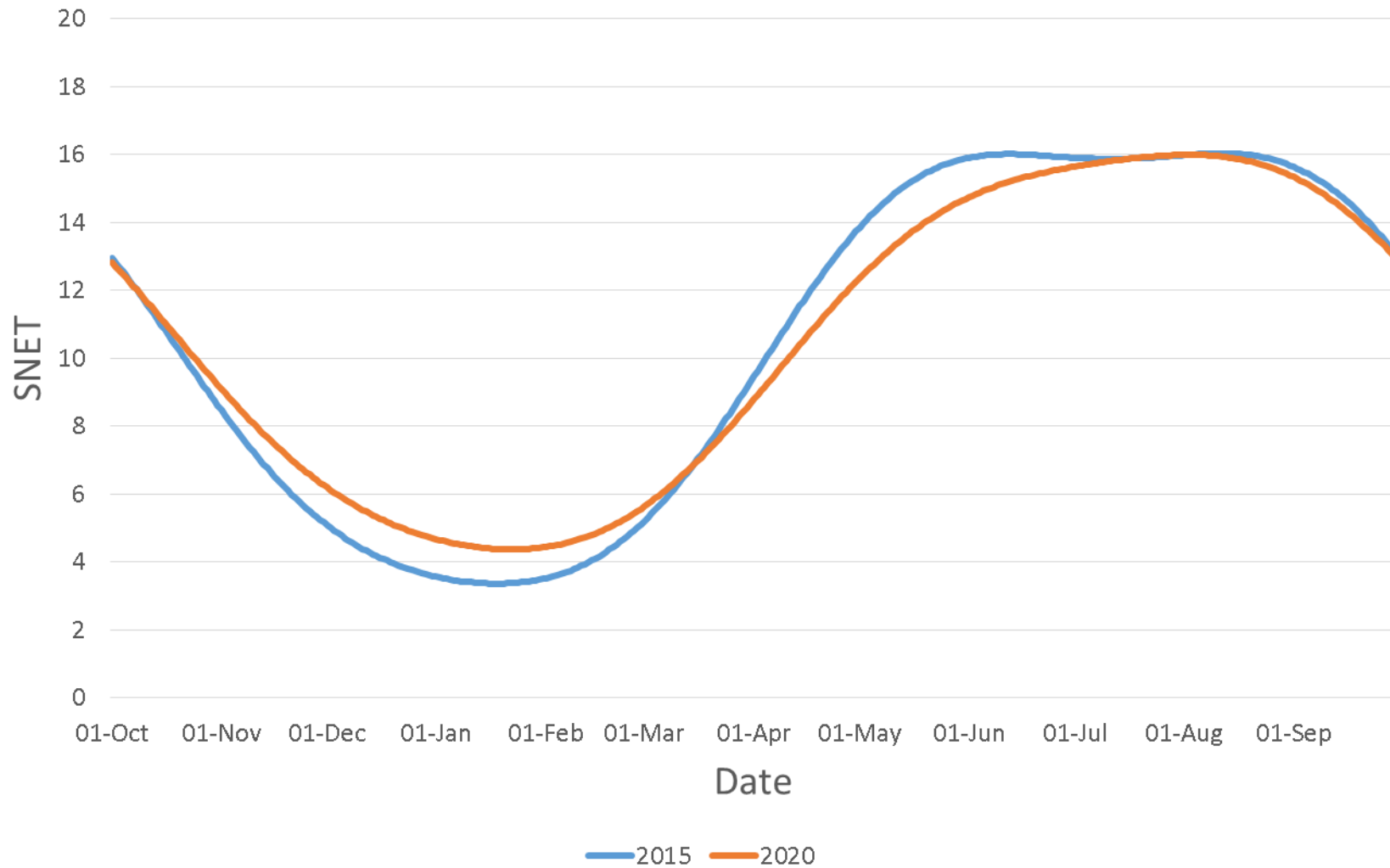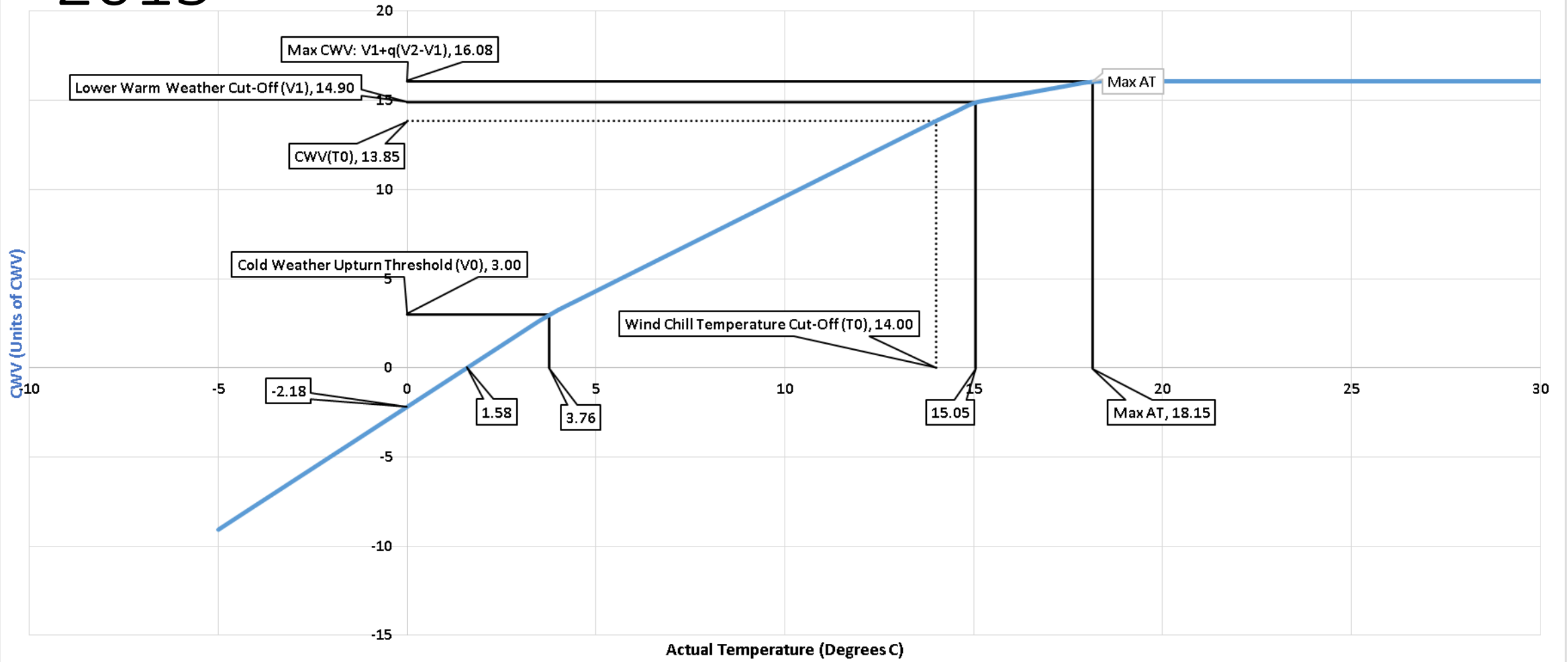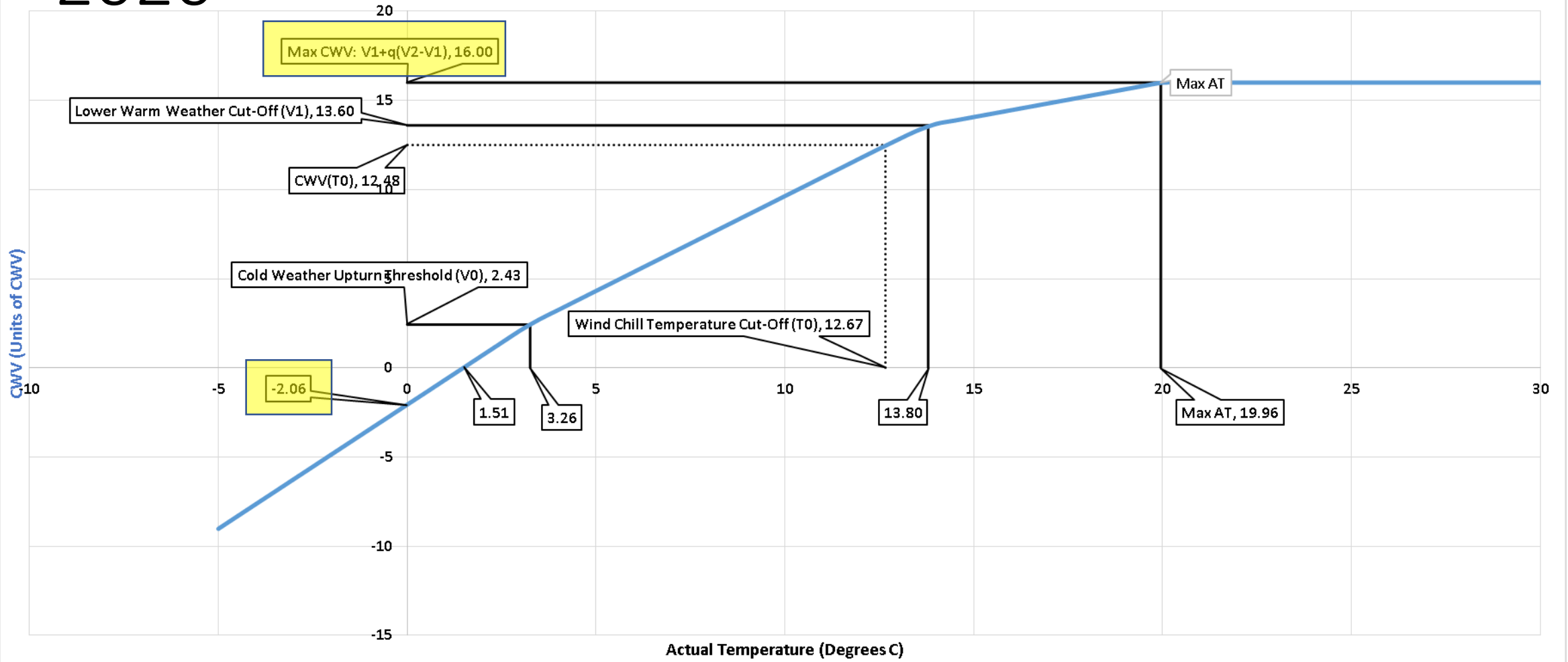
Results: LDZ WS

Parameter	2015	2020
Effective Temperature/AT Weight	0.500	0.528
Effective Temperature Weight (I1)	0.669	0.627
Wind Chill Weight (I2)	0.0101	0.011
Cold Weather Sensitivity (I3)	0.11	0.182
Cold Weather Upturn Threshold (V0)	3	0.843
Lower Warm Weather Cut-Off (V1)	14.8	13.680
Upper Warm Weather Cut-Off (V2)	17.9	18.525
Slope Relating to Warm Weather Cut-Off (q)	0.46	0.518
Wind Chill Wind Cut-Off (W0)	0	1.453
Wind Chill Temperature Cut-Off (T0)	14	13.980
R2	**0.9825**	**0.9829**

CWV Optimisation alone

CWV Optimisation

LDZ	Station
WS	St Athan

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	8.56%
2020	8.92%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9825	4097	
0.9829	4064	

MAPE

Month	2015	2020
Jan	4.27%	4.27%
Feb	4.10%	4.08%
Mar	7.11%	6.76%
Apr	12.67%	12.05%
May	12.50%	12.43%
Jun	10.95%	12.33%
Jul	10.77%	14.44%
Aug	9.58%	10.36%
Sep	10.39%	10.46%
Oct	8.61%	8.17%
Nov	5.42%	5.38%
Dec	6.06%	6.05%
All	8.56%	8.92%
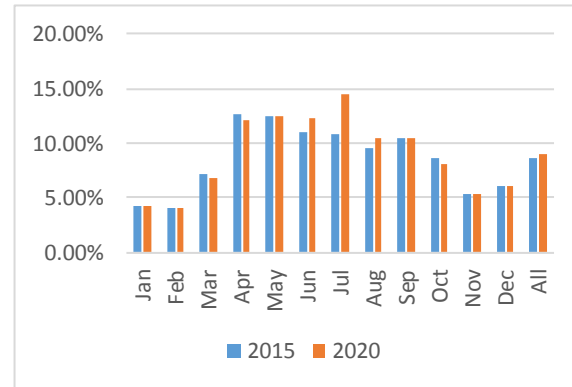
Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.84%	10.74%	10.43%	8.15%
2020	4.82%	10.40%	12.38%	8.00%

RMSE

Month	2015	2020
Jan	4385	4372
Feb	4050	3951
Mar	5240	5045
Apr	6005	5781
May	4482	4444
Jun	2816	3012
Jul	1962	2438
Aug	1880	1953
Sep	3059	2938
Oct	3628	3508
Nov	4156	4179
Dec	5210	5253
All	4097	4064

Season

Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4681	5270	2252	3610
2020	4657	5112	2499	3577
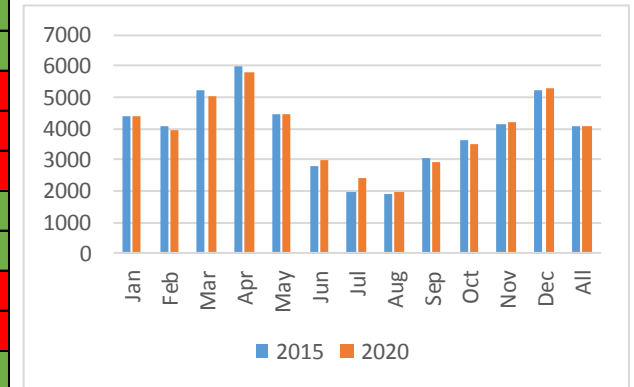
Plus Revised Temperature and Wind Weights

LDZ	Station
WS	St Athan

Gas Years	2010/11 to 2017/18

Parameters	Avg. Mean Abs. %Error
2015	8.56%
2020	8.72%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9825	4097	
0.9835	4035	

MAPE

Month	2015	2020
Jan	4.27%	4.38%
Feb	4.10%	4.03%
Mar	7.11%	6.52%
Apr	12.67%	11.44%
May	12.50%	12.19%
Jun	10.95%	12.12%
Jul	10.77%	14.10%
Aug	9.58%	10.28%
Sep	10.39%	10.01%
Oct	8.61%	7.56%
Nov	5.42%	5.39%
Dec	6.06%	6.32%
All	8.56%	8.72%
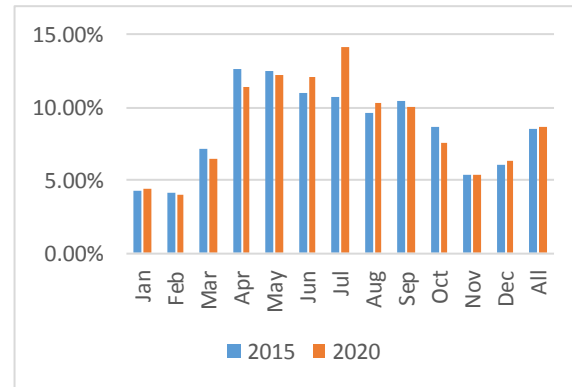
		Season			
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov	
2015	4.84%	10.74%	10.43%	8.15%	
2020	4.94%	10.04%	12.17%	7.65%	

RMSE

Month	2015	2020
Jan	4385	4476
Feb	4050	3940
Mar	5240	4960
Apr	6005	5644
May	4482	4392
Jun	2816	2930
Jul	1962	2381
Aug	1880	1944
Sep	3059	2787
Oct	3628	3310
Nov	4156	4211
Dec	5210	5434
All	4097	4035

		Season			
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov	
2015	4681	5270	2252	3559	
2020	4758	5018	2446	3484	
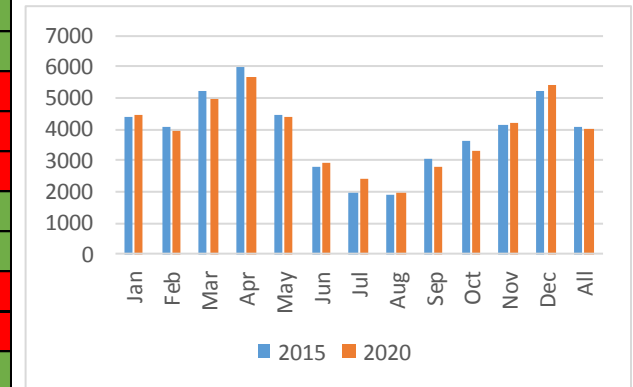
WS LDZ Pseudo SNET Profiles
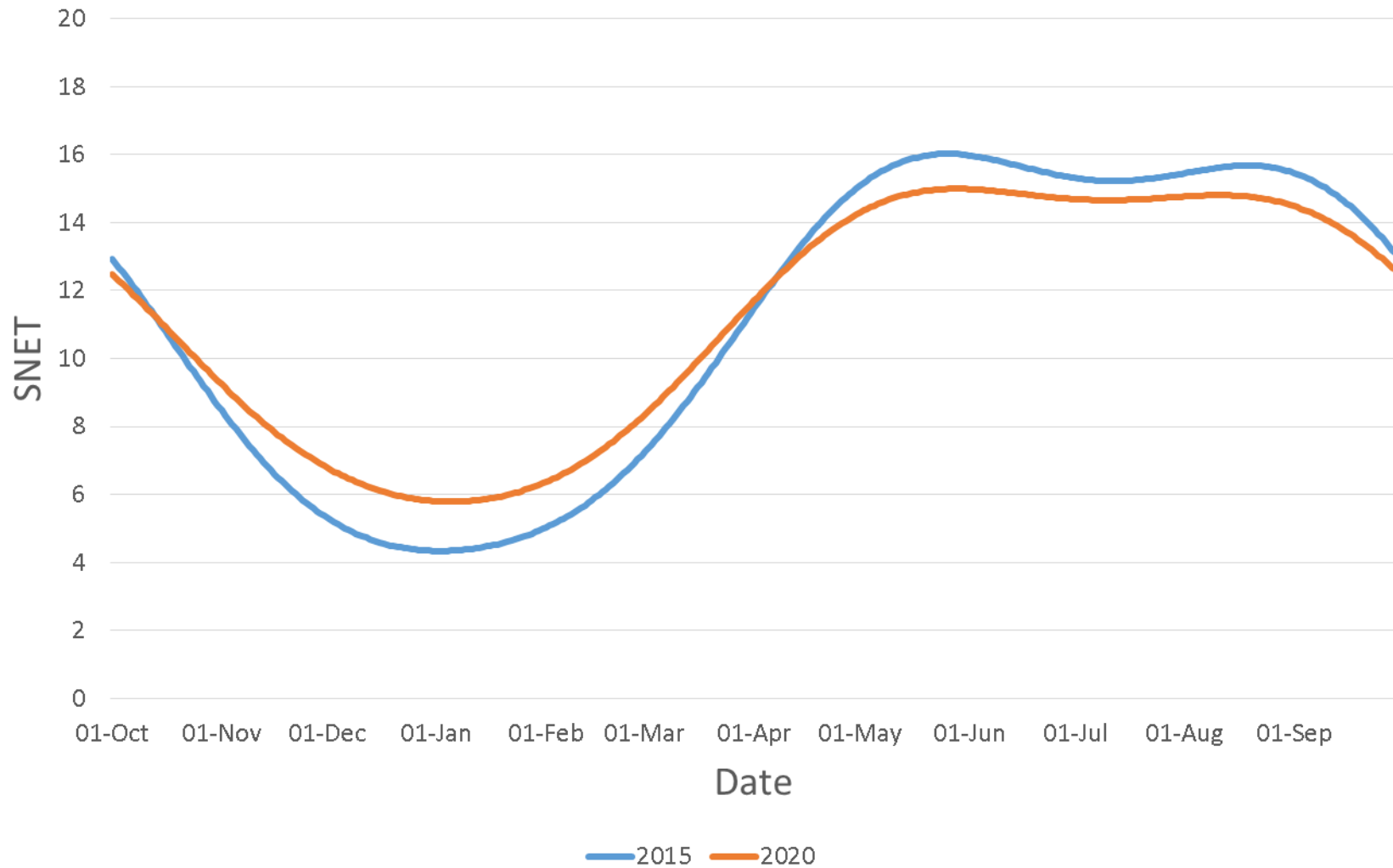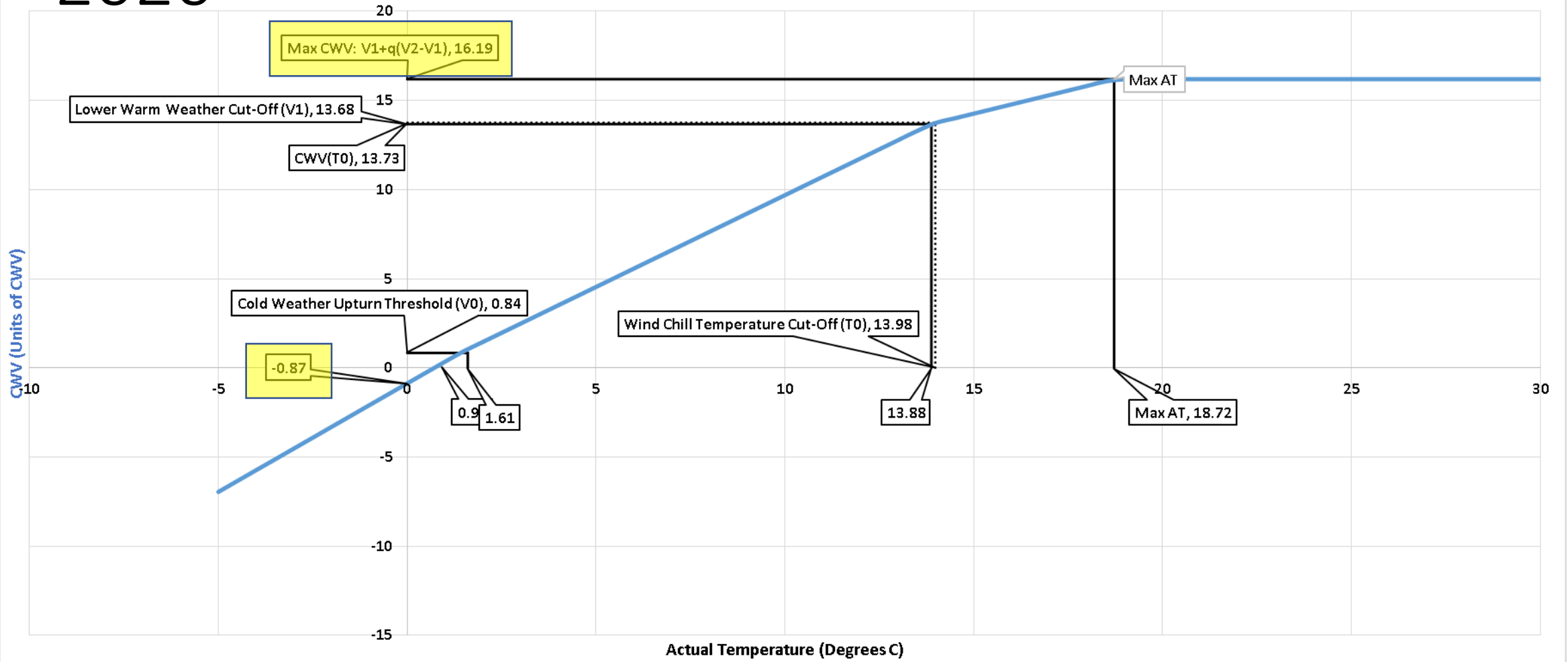
Parameter Interpretations

Parameter	Interpretations
Effective Temperature/AT Weight (ET calculation)	Determines the combination of AT/ET used in the SNET calculation and how much of yesterday ET is used for todays ET
Effective Temperature Weight (I1)	What proportion of SNET is included in SNET Term (≈0.3)
Wind Chill Weight (I2)	In combination with W0 & T0 calculates WCT – gives a colder CWV where AT is less than T0
Cold Weather Sensitivity (I3)	CWV Cold: Determines when cold weather upturn is applied.
Cold Weather Upturn Threshold (V0)	
Lower Warm Weather Cut-Off (V1)	CWV Transition : 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)	determines at what speed wind (DWS) produces a wind chill effect
Wind Chill Temperature Cut-Off (T0)	values of temperature (AT) when wind chill is applied

LDZ/Weather Stations

LDZ	Weather Station
EA	Heathrow
EM	Watnall (Nottingham)
NE	Watnall (Nottingham)
NO	Albemarle
NT	Heathrow
NW	Manchester Rostherne
SC	Glasgow Bishopton
SE	Heathrow
SO	Southampton Oceanographic Centre
SW	Yeovilton (from Filton)
WM	Winterbourne/Coleshill (Birmingham)
WN	Manchester Rostherne
WS	St Athan

Weather data history was complete in most LDZs, requiring minimal cleaning/filling, except for:

WM – use of Coleshill temperatures for the period 01/10/2010-28/02/2011 due to missing Winterbourne station data