CWV+ definition

Jason Blackmore

Agenda

- Review use of Total SSE, rather than each X years in the optimisation & V1, V2, q (max CWV)/summer/winter trade off.
- Review more detail on the SNES. Any questions or comments on the SNES approach – see pre-read “SNET & SNES calculation”
- Future proofing CWV+ for the inclusion of rainfall
- Agreement sought today on the CWV+ definition
- Agree next Steps

Questions since last meeting

Luke Reeves EDF Energy

Following the DESC meeting on Monday I had a question about the CWV+ methodology: whether Jason Blackmore had thought about transforming the HH solar radiation readings before taking the daily average. This might help to differentiate between days which are sunny in the morning and then cloudy in the afternoon and those that are sunny all day. Might introduce a problem with the transformation when solar is 0 for an individual HH though.

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Findings: The log transformation of hourly data tended to reduce the diurnal variability of solar, somewhat equalising the measurement of low solar hours (early morning) and high solar hours (midday).

When the transformation was applied to the hourly values, the resultant difference (average or sum of day) tended to give a biased level of transformation. In part this was due to the data regularly having a difference in the number of hours of actual solar observation versus the seasonal normal, with the seasonal normal solar values have more low solar measurements in the morning and evening.

Its likely some type of transformation on the hourly, rather then the daily summation will provide a better solar measurement, I would expect it to be a incremental improvement and could be included as a piece of analysis for the CWV work plan.

Total SSE or X years – review of results

Produced a series of optimisations based upon X years, Total SSE and Total SSE & one goal seek method with “maximum allowed time without improvement option” of 30 minutes.

Results available for 3 LDZs EM, NT & WM for the following:

- 2015:CWV definition, 2015 SNET and Parameters
- 2020:CWV definition, 2020 SNET and Parameters
- CWV+:CWV+ definition, 2020 SNET and Parameters

Conclusion: Total SSE method gives better optimisations. Additionally the quicker run time allows for more practical results using Total SSE & one goal seek.

X Years

LDZ	2015	2020	CWV+
EM	**0.9916**	**0.9914**	**0.9921**
NT	**0.9930**	**0.9929**	**0.9937**
WM	**0.9918**	**0.9922**	**0.9926**

Benchmark results

Total SSE

LDZ	2015	2020	CWV+
EM	**0.9916**	**0.9914**	**0.9925**
NT	**0.9930**	**0.9932**	**0.9938**
WM	**0.9921**	**0.9927**	**0.9931**

Benefit from including solar

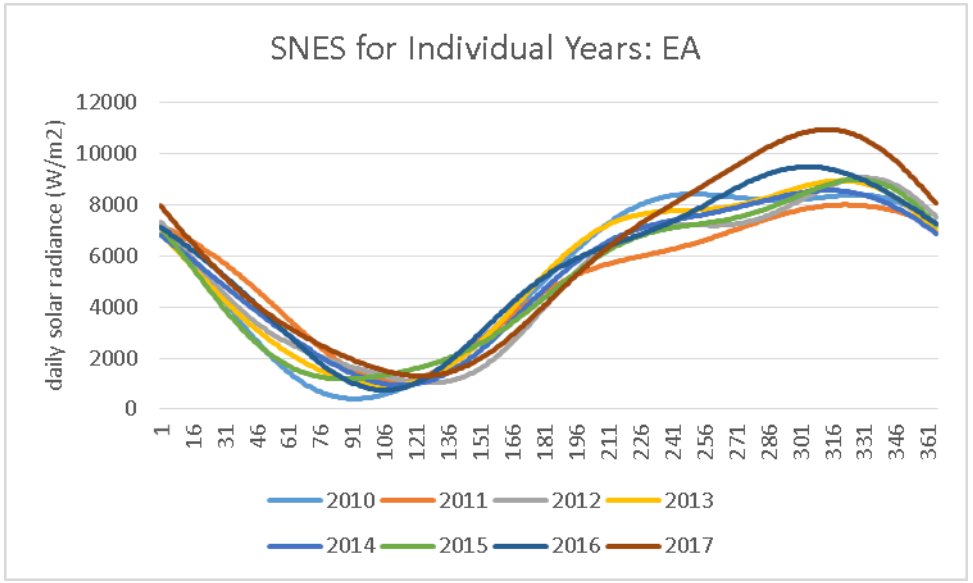
Total SSE & one goal seek

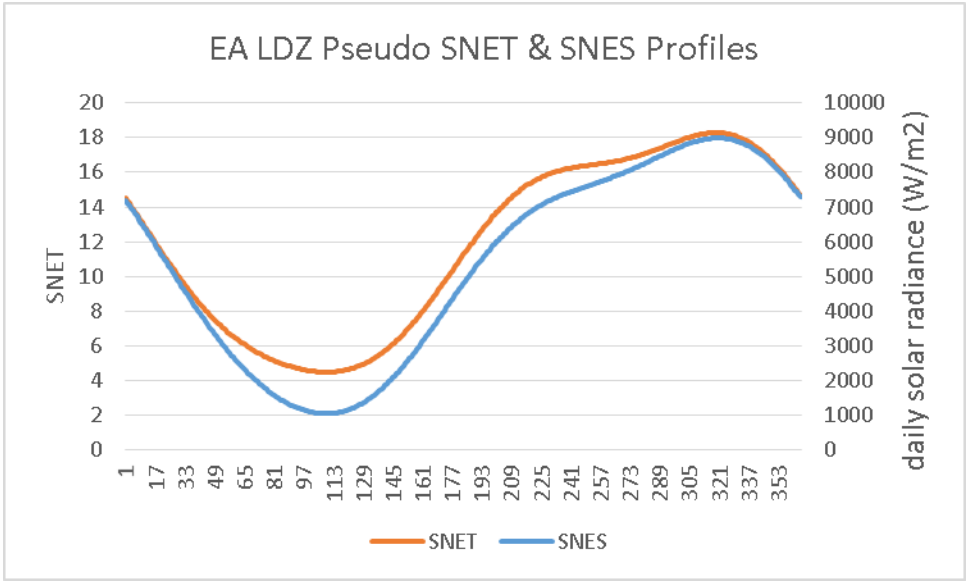
LDZ	CWV+
EM	**0.9927**
NT	**0.9939**
WM	**0.9933**

Further improvement from Total SSE method

SNES Profile is similar to SNET

For more detail on calculation see pre-read “SNET & SNES calculation”





Future proof CWV+

Discussion point: How can the CWV definition become more flexible to future changes in its calculation?

Suggestion for Rainfall:

- Rainfall parameter initial value is 0.
- Rainfall measurement calculated for each gas day.

CWV+ definition could include rainfall in its calculation, with the parameter value dependant upon future work, as part of a more regular yearly review of CWV?

Summary Results Follow

R2 Summary

LDZ	2015	2020	CWV+
EA	**0.9910**	**0.9909**	
EM	**0.9916**	**0.9915**	**0.9927**
NE	**0.9862**	**0.9862**	
NO	**0.9855**	**0.9844**	
NT	**0.9930**	**0.9929**	**0.9939**
NW	**0.9884**	**0.9878**	
SC	**0.9887**	**0.9886**	
SE	**0.9914**	**0.9915**	
SO	**0.9916**	**0.9908**	
SW	**0.9902**	**0.9877**	
WM	**0.9918**	**0.9922**	**0.9933**
WN	**0.9835**	**0.9843**	
WS	**0.9825**	**0.9829**	

CWV+ results better than existing parameters and new parameters under the current CWV definition.

MAPE Summary

LDZ	2015	2020	CWV+
EA	**5.55**	**6.13**	
EM	**6.67**	**6.92**	**6.47**
NE	**6.78**	**7.01**	
NO	**7.27**	**7.42**	
NT	**4.70**	**4.89**	**4.66**
NW	**6.59**	**6.83**	
SC	**5.83**	**6.14**	
SE	**5.20**	**5.44**	
SO	**5.60**	**6.51**	
SW	**5.99**	**6.91**	
WM	**6.55**	**7.02**	**6.32**
WN	**7.39**	**7.25**	
WS	**8.56**	**8.92**	

CWV+ results better than existing parameters and new parameters under the current CWV definition.

Detailed LDZ Results Follow

Results

Results available for 3 LDZs EM, NT & WM for the following:

- 2015:CWV definition, 2015 SNET and Parameters
- 2020:CWV definition, 2020 SNET and Parameters
- CWV+:CWV+ definition, 2020 SNET and Parameters

Results: LDZ EM

Parameter	2015	2020	CWV+
Effective Temperature/AT Weight	0.500	0.476	0.5303
Effective Temperature Weight (I1)	0.691	0.679	0.680
Wind Chill Weight (I2)	0.0144	0.014	0.014
Cold Weather Sensitivity (I3)	0.05	0.189	0.024
Cold Weather Upturn Threshold (V0)	3	1.436	-1.668
Lower Warm Weather Cut-Off (V1)	13.5	13.136	13.381
Upper Warm Weather Cut-Off (V2)	16.8	17.676	16.612
Slope Relating to Warm Weather Cut-Off (q)	0.49	0.454	0.510
Wind Chill Wind Cut-Off (W0)	0	1.538	-4.355
Wind Chill Temperature Cut-Off (T0)	14	14.516	13.936
Solar Radiance Effect (S0)	-	-	0.436
R2	**0.9916**	**0.9915**	**0.9925**

Total SSE method allows for better optimisations for V1, V2 & q, removing the trade off between summer and winter results

CWV Optimisation

LDZ	Station
EM	Watnall (Nottingham)

Gas Years	2010/11 to 2017/18

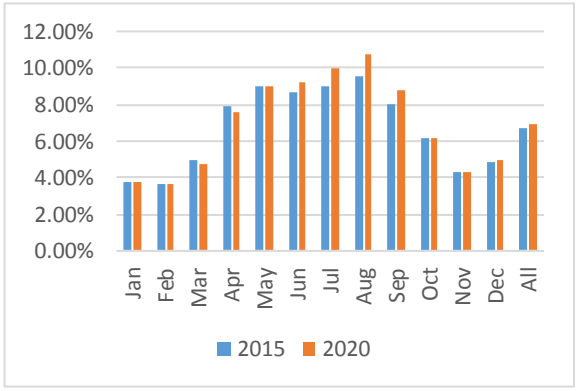
Parameters	Avg. Mean Abs. %Error
2015	6.67%
2020	6.92%

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%

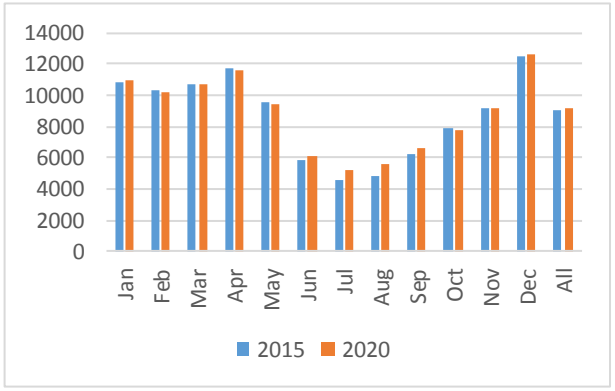
Season				
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.09%	7.27%	9.10%	6.16%
2020	4.11%	7.12%	9.99%	6.39%



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



2020 CWV+

LDZ	Station
EM	Watnall (Nottingham)

Gas Years	2010/11 to 2017/18

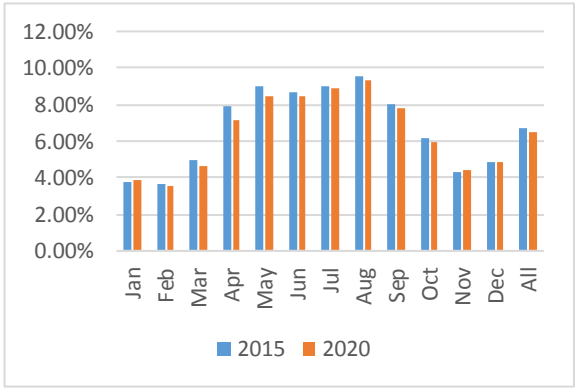
Parameters	Avg. Mean Abs. %Error
2015	6.67%
2020	6.47%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9919	9060	
0.9925	8830	

MAPE

Month	2015	2020
Jan	3.78%	3.81%
Feb	3.61%	3.58%
Mar	4.93%	4.58%
Apr	7.91%	7.17%
May	8.98%	8.46%
Jun	8.66%	8.41%
Jul	9.06%	8.92%
Aug	9.57%	9.37%
Sep	8.04%	7.85%
Oct	6.11%	5.96%
Nov	4.33%	4.41%
Dec	4.83%	4.85%
All	6.67%	6.47%

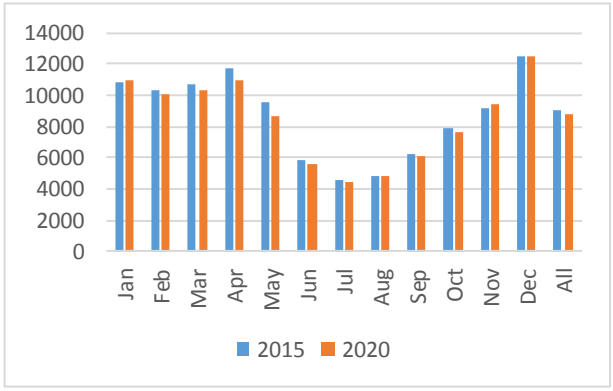
Season				
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.09%	7.27%	9.10%	6.16%
2020	4.10%	6.73%	8.91%	6.07%



RMSE

Month	2015	2020
Jan	10835	10988
Feb	10316	10029
Mar	10744	10287
Apr	11739	10957
May	9518	8679
Jun	5817	5548
Jul	4541	4436
Aug	4832	4812
Sep	6284	6134
Oct	7891	7628
Nov	9143	9393
Dec	12470	12507
All	9060	8830

Season				
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	11299	10694	5084	7869
2020	11276	10009	4947	7830



2020 CWV+ variance v CWV benchmark

MAPE Variance from 2015 Parameters: EM

	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	-0.11%	0.08%	-0.12%	0.04%	0.27%	0.09%	0.07%	-0.03%	0.04%
Feb	-0.05%	-0.17%	-0.20%	-0.08%	-0.09%	0.25%	0.09%	0.01%	-0.03%
Mar	-0.36%	-1.70%	0.05%	-0.57%	0.21%	-0.30%	-0.58%	0.42%	-0.36%
Apr	-1.80%	-0.49%	0.39%	-0.48%	-1.91%	-0.17%	-1.49%	0.05%	-0.74%
May	-0.50%	-0.67%	-1.34%	-0.57%	0.05%	-0.18%	-0.52%	-0.39%	-0.52%
Jun	-0.05%	-0.55%	-0.51%	0.21%	0.16%	-0.75%	-0.39%	-0.15%	-0.25%
Jul	-0.46%	-0.76%	0.09%	-0.03%	-0.18%	0.02%	0.07%	0.11%	-0.14%
Aug	-1.95%	0.03%	-0.05%	0.77%	-0.57%	0.32%	-0.35%	0.20%	-0.20%
Sep	-0.69%	0.35%	0.31%	-0.08%	-0.73%	-0.24%	-0.39%	-0.04%	-0.19%
Oct	-0.32%	-0.64%	-0.36%	0.01%	0.69%	-0.27%	0.01%	-0.35%	-0.15%
Nov	0.59%	0.02%	0.24%	-0.24%	0.18%	-0.13%	-0.12%	0.13%	0.08%
Dec	-0.14%	-0.03%	0.15%	0.09%	-0.07%	-0.16%	0.14%	0.13%	0.01%
All Months	-0.49%	-0.38%	-0.11%	-0.08%	-0.17%	-0.13%	-0.29%	0.01%	**-0.20%**

No summer and winter trade off, clear improvement for March to May

Results: LDZ NT

Parameter	2015	2020	CWV+
Effective Temperature/AT Weight	0.500	0.471	0.4731
Effective Temperature Weight (I1)	0.727	0.730	0.728
Wind Chill Weight (I2)	0.0151	0.015	0.017
Cold Weather Sensitivity (I3)	0.22	0.345	0.124
Cold Weather Upturn Threshold (V0)	3	2.130	2.276
Lower Warm Weather Cut-Off (V1)	15.2	14.719	15.036
Upper Warm Weather Cut-Off (V2)	19.2	19.444	19.693
Slope Relating to Warm Weather Cut-Off (q)	0.38	0.438	0.370
Wind Chill Wind Cut-Off (W0)	0	-1.157	-2.052
Wind Chill Temperature Cut-Off (T0)	14	13.537	12.662
Solar Radiance Effect (S0)	-	-	0.465
R2	**0.9930**	**0.9929**	**0.9939**

CWV Optimisation

LDZ	Station
NT	Heathrow

Gas Years	2010/11 to 2017/18

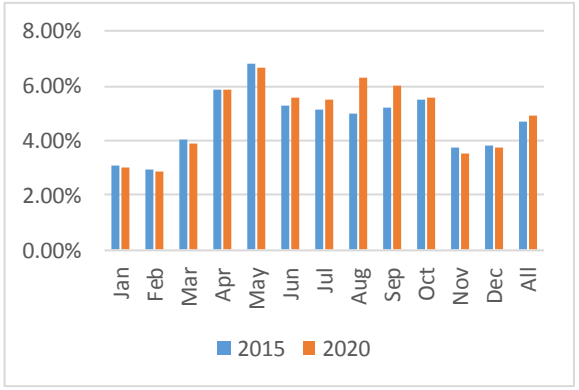
Parameters	Avg. Mean Abs. %Error
2015	4.70%
2020	4.89%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9930	7748	
0.9929	7738	

MAPE

Month	2015	2020
Jan	3.07%	3.03%
Feb	2.92%	2.84%
Mar	4.04%	3.91%
Apr	5.87%	5.89%
May	6.79%	6.66%
Jun	5.26%	5.58%
Jul	5.11%	5.49%
Aug	4.99%	6.30%
Sep	5.17%	5.97%
Oct	5.52%	5.58%
Nov	3.76%	3.56%
Dec	3.82%	3.74%
All	4.70%	4.89%

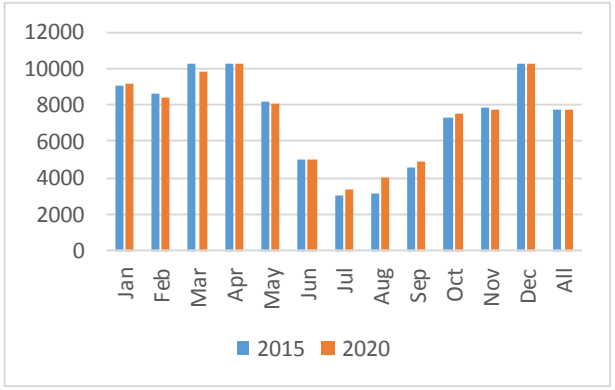
	Season			
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	3.28%	5.56%	5.12%	4.82%
2020	3.22%	5.48%	5.79%	5.04%



RMSE

Month	2015	2020
Jan	9072	9193
Feb	8569	8399
Mar	10281	9880
Apr	10238	10228
May	8205	8025
Jun	4993	4969
Jul	3059	3362
Aug	3104	4018
Sep	4550	4923
Oct	7360	7488
Nov	7882	7734
Dec	10308	10236
All	7748	7738

	Season			
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	9483	9616	3811	6756
2020	9478	9419	4160	6842



2020 CWV+

LDZ	Station
NT	Heathrow

Gas Years	2010/11 to 2017/18

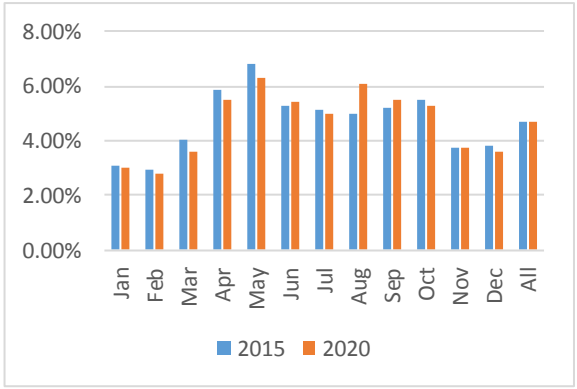
Parameters	Avg. Mean Abs. %Error
2015	4.70%
2020	4.66%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9930	7748	
0.9939	7398	

MAPE

Month	2015	2020
Jan	3.07%	3.04%
Feb	2.92%	2.82%
Mar	4.04%	3.57%
Apr	5.87%	5.46%
May	6.79%	6.26%
Jun	5.26%	5.43%
Jul	5.11%	5.01%
Aug	4.99%	6.10%
Sep	5.17%	5.53%
Oct	5.52%	5.25%
Nov	3.76%	3.73%
Dec	3.82%	3.63%
All	4.70%	4.66%

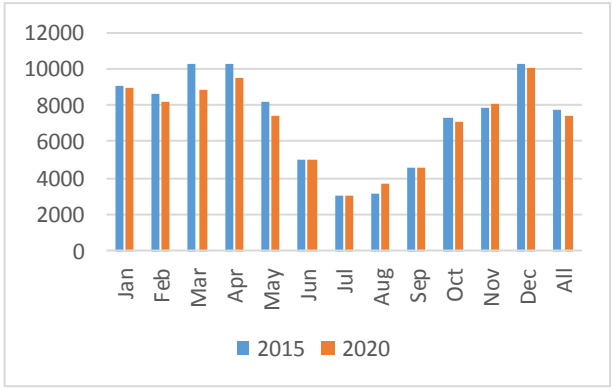
Season				
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	3.28%	5.56%	5.12%	4.82%
2020	3.17%	5.09%	5.51%	4.84%



RMSE

Month	2015	2020
Jan	9072	8983
Feb	8569	8217
Mar	10281	8892
Apr	10238	9507
May	8205	7461
Jun	4993	5038
Jul	3059	3017
Aug	3104	3736
Sep	4550	4607
Oct	7360	7098
Nov	7882	8020
Dec	10308	9992
All	7748	7398

Season				
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	9483	9616	3811	6722
2020	9219	8653	4006	6735



2020 CWV+ variance v CWV benchmark

MAPE Variance from 2015 Parameters: NT

	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	0.25%	-0.26%	-0.38%	-0.01%	0.14%	0.32%	-0.25%	-0.03%	-0.03%
Feb	0.02%	0.11%	0.45%	0.40%	0.07%	0.17%	0.04%	0.15%	0.11%
Mar	-0.40%	-0.64%	-0.86%	-0.88%	-0.37%	-0.28%	-0.12%	-0.22%	-0.47%
Apr	-0.12%	0.15%	0.00%	-0.44%	-0.37%	-0.72%	-0.83%	-0.99%	-0.41%
May	-0.85%	-0.64%	-0.82%	-0.20%	-0.25%	-0.70%	-0.16%	-0.56%	-0.52%
Jun	-0.83%	0.65%	0.08%	0.15%	0.70%	-0.16%	0.16%	0.66%	0.17%
Jul	0.08%	0.27%	-0.82%	0.22%	0.97%	-0.09%	0.63%	-2.08%	-0.10%
Aug	2.04%	0.94%	1.51%	0.84%	2.10%	0.11%	0.67%	0.62%	1.10%
Sep	-1.12%	2.01%	0.44%	1.23%	-1.26%	2.72%	-0.68%	0.38%	0.35%
Oct	-0.43%	-0.59%	-0.08%	-0.49%	0.63%	-0.50%	0.30%	-1.00%	-0.26%
Nov	0.51%	-0.15%	-0.32%	-0.26%	-0.33%	0.44%	0.09%	-0.20%	-0.03%
Dec	-0.32%	-0.34%	-0.73%	-0.18%	-0.01%	0.37%	-0.05%	-0.23%	-0.19%
All Months	-0.10%	0.11%	-0.28%	-0.03%	0.17%	0.14%	-0.02%	-0.32%	**-0.04%**

Results: LDZ WM

Parameter	2015	2020	CWV+
Effective Temperature/AT Weight	0.500	0.467	0.4822
Effective Temperature Weight (I1)	0.72	0.692	0.689
Wind Chill Weight (I2)	0.0111	0.012	0.013
Cold Weather Sensitivity (I3)	0.14	0.242	0.145
Cold Weather Upturn Threshold (V0)	3	2.264	2.699
Lower Warm Weather Cut-Off (V1)	13.7	13.367	13.358
Upper Warm Weather Cut-Off (V2)	17.2	18.292	17.335
Slope Relating to Warm Weather Cut-Off (q)	0.43	0.424	0.430
Wind Chill Wind Cut-Off (W0)	0	0.186	-1.995
Wind Chill Temperature Cut-Off (T0)	14	16.029	14.660
Solar Radiance Effect (S0)			0.536
R2	**0.9918**	**0.9922**	**0.9933**

CWV Optimisation

LDZ	Station
WM	Winterbourne

Gas Years	2010/11 to 2017/18

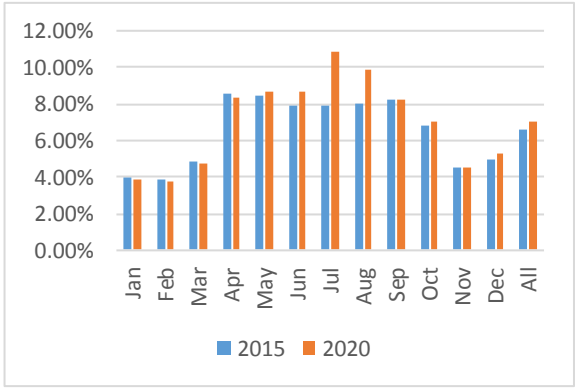
Parameters	Avg. Mean Abs. %Error
2015	6.55%
2020	7.02%

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

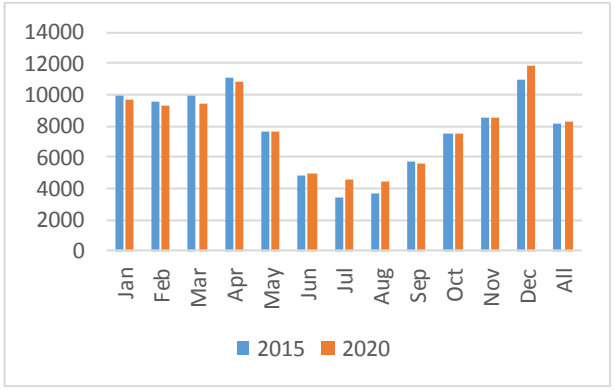
Season				
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.30%	7.29%	7.98%	6.56%
2020	4.34%	7.23%	9.85%	6.60%



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



2020 CWV+

LDZ	Station
WM	Winterbourne

Gas Years	2010/11 to 2017/18

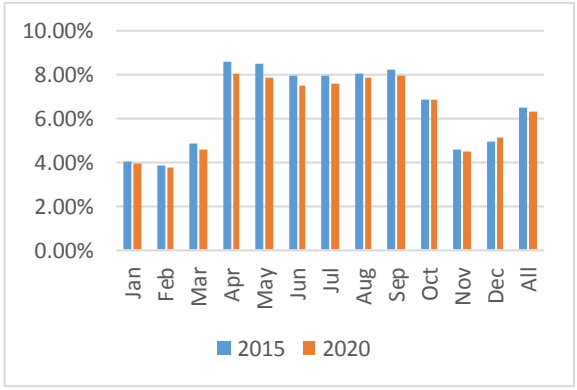
Parameters	Avg. Mean Abs. %Error
2015	6.55%
2020	6.32%

Avg. Adj. R-Sq.	Avg. RMSE (MWhs)	Avg. %diff. in est 1 in20 peak demand
0.9921	8155	
0.9933	7920	

MAPE

Month	2015	2020
Jan	4.01%	3.99%
Feb	3.90%	3.75%
Mar	4.88%	4.54%
Apr	8.57%	8.07%
May	8.48%	7.83%
Jun	7.95%	7.53%
Jul	7.96%	7.62%
Aug	8.02%	7.87%
Sep	8.24%	7.97%
Oct	6.86%	6.86%
Nov	4.57%	4.54%
Dec	4.96%	5.13%
All	6.55%	6.32%

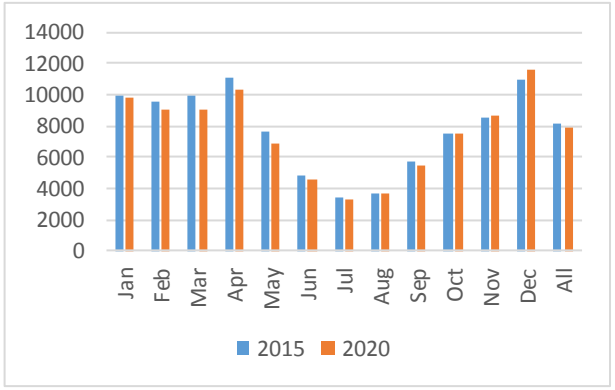
Season				
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	4.30%	7.29%	7.98%	6.56%
2020	4.31%	6.80%	7.67%	6.46%



RMSE

Month	2015	2020
Jan	9870	9818
Feb	9533	9088
Mar	9882	9034
Apr	11130	10350
May	7659	6896
Jun	4861	4519
Jul	3452	3281
Aug	3642	3621
Sep	5746	5475
Oct	7556	7451
Nov	8514	8694
Dec	10956	11548
All	8155	7920

Season				
Year	Dec - Feb	Mar - May	Jun-Aug	Sep- Nov
2015	10198	9647	4024	7397
2020	10259	8857	3835	7329



2020 CWV+ variance v CWV benchmark

MAPE Variance from 2015 Parameters: WM

	2010	2011	2012	2013	2014	2015	2016	2017	All Years
Jan	-0.28%	-0.04%	0.13%	0.02%	0.08%	0.04%	0.00%	-0.09%	-0.02%
Feb	0.60%	-0.09%	-0.29%	-0.61%	-0.44%	0.02%	-0.22%	-0.15%	-0.15%
Mar	-0.25%	0.10%	-0.62%	-0.46%	-0.45%	-0.11%	-0.56%	-0.34%	-0.34%
Apr	0.06%	-0.73%	-0.22%	-0.57%	-0.54%	-0.33%	-0.57%	-1.04%	-0.49%
May	-0.30%	-0.75%	-2.07%	-1.03%	-0.28%	-0.62%	-0.54%	0.38%	-0.65%
Jun	-1.02%	-0.52%	-0.79%	-0.57%	-0.16%	-0.03%	-0.69%	0.41%	-0.42%
Jul	-0.85%	-0.75%	-0.32%	0.19%	-0.54%	-0.21%	-0.13%	-0.14%	-0.34%
Aug	-0.38%	-0.32%	0.84%	-0.66%	-1.42%	0.74%	-0.58%	0.56%	-0.15%
Sep	-1.17%	0.43%	0.19%	-0.47%	-1.67%	0.75%	0.53%	-0.74%	-0.27%
Oct	1.51%	-1.29%	0.66%	0.48%	1.35%	-1.52%	-1.28%	0.07%	0.00%
Nov	1.33%	-1.38%	0.32%	0.28%	-1.00%	0.29%	0.63%	-0.70%	-0.03%
Dec	0.89%	0.29%	-0.05%	0.28%	-0.26%	-0.12%	0.04%	0.29%	0.17%
All Months	0.01%	-0.42%	-0.19%	-0.26%	-0.45%	-0.09%	-0.28%	-0.12%	**-0.22%**

Appendix

CWV Adhoc Work plan

Work Item	Detail
Revised Temperature and Wind Weights	Analysis during CWV work did support revised weights for temperature, however the analysis was done after SNET was produced, thus it is recommended that a review of these is done prior to the next calculation of SNET and CWV parameters.
Yearly Update of CWV	The aim of this work is to produce a method and tool with data visibility that can be improved and allow CWV to be optimised frequently.
Inclusion of rainfall	Determine the value of the rainfall parameter. Expand CWV optimisation to allow modelling of all daytypes.
SNET/SNES calculation	As above inclusion of additional daytypes and allowing revised temperature weights.

CWV 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

CWV+ Approach

- Same data and optimisation method as CWV, plus
  - Observations of solar radiance (W/m2)
  - CCM solar seasonal normal
  - Difference between obs and seasonal normal used to determine bright or dull days (variance from seasonal normal)
  - Log transformation of difference used to remove scale
  - New parameter S0 is optimised for each of the X years and the average taken as the parameter value
  - Seasonal Normal Solar – defined and calculated as SNES

Full details in CWV+ Description.pdf & SNET & SNES Description.pdf

General comments on optimisation

- Optimisation attempts to find the best set of parameters that produces the highest model fit as measured by minimizing SSE for each of the X years.
- Given the range of parameters to be optimised and the scale of the computations it not possible to search all possible values to find a “global minimum”, therefore many of the results are likely to be “local minimums”.
- It’s a feature of the current approach and the 2015 parameters would also be affected by the issue.

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
Solar Radiance Effect (S0)	Solar effect on demand

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