Treatment of EUC Cut-Offs: Spring 2018

At its meeting on 13th February 2018 DESC discussed the approach when making decisions as to whether to apply a Composite Weather Variable (CWV) cut-off to the smoothed model for the End User Category (EUC). Specifically, the instances where the smoothed EUC models 'flip' from having a cut-off one year to not having a cut-off the next year (and vice versa).

As a result of this discussion, action DESC 0202 was raised – see below:

New Action DESC 0202:
"Xoserve (MP) to work with TWG to investigate the 'cut off' process deployed and assess if any process changes are required".

This document explains how the EUC modelling is performed in relation to the EUC cut-offs.

Background

For some EUCs, it is necessary to apply a 'summer cut-off' to the demand model recognising that demand 'flattens off' in the summer before the CWV reaches its maximum value. In these instances a 'CWV cut-off' is applied such that, for values of CWV greater than the cut-off, demand is assumed to be insensitive to variations in CWV.

The decision as to whether to apply such a CWV cut-off, and the selection of the value of the cut-off, is applied on the consistent basis set out below. A CWV cut-off is applied if either of the following conditions holds:

Criteria (i)
There is strong statistical evidence that a 'levelling off' of demands occurs at some point during the 'warmest days'

or

Criteria (ii)
Demands associated with the model at maximum CWV are either negative or close to zero. Negative model demands are clearly undesirable and values too close to zero could lead to unacceptable values of the DAF.

Note: No cut-offs are applied to the EUCs in the consumption range 0 - 293 MWh pa.

Application of CWV Cut-Offs in Individual Year EUC Demand Model:

The following technical details relate to the fitting of the composite weather variable cut-off, if applicable:

The CWV intercept where the regression line crossed the CWV axis, is calculated as:

$$\text{CWV intercept} = -C_1/C_2$$

Best-Fit Cut-Off

A cut-off is applied under criterion (i), explained above, if the best fit potential cut-off between 0.5^o and 4° below the maximum CWV leads to an improvement of more than **20%** in the mean square residual error for estimated demands with CWV values in the top 4°, i.e.

$$1.2 * \text{Mean square error with the best-fit cut-off} < \text{Mean square error without a cut-off}$$

The value of the cut-off applied in these circumstances is the value (in the CWV range above) with the best fit in terms of the mean square error.

Imposed Cut-Off

Where the CWV intercept is a lesser value than the maximum CWV for the LDZ plus 0.5^o, a cut-off is applied under the criterion (ii), explained above, the cut-off value imposed is:

$$\text{CWV intercept} - 0.5^o$$

If neither of the above criteria are met then the individual year EUC model does not have a cut-off applied.

Application of CWV Cut-Offs in Smoothed EUC Demand Model:

A decision is made as to whether to apply a composite weather variable cut-off to the smoothed model for the EUC.
The criterion used in making the decision is as follows:

- The value of the CWV cut-off is obtained for each of the three individual year's model.
- If no cut-off is required, the cut-off value for that year is set to the maximum CWV for the LDZ.
- The three individual years' CWV cut-offs are then averaged.
- If this average value is less than the maximum CWV for that LDZ, a CWV cut-off is set at this value in the smoothed model.
- Otherwise no CWV cut-off is applied to the smoothed model.

The existence or not of a cut-off in each smoothed EUC demand model is a function of the sample data (the validated sample available for any EUC changes from year to year), the range of weather that prevailed in each analysis year going into model smoothing and the CWV definition itself (when that has changed from one year to the next).

The fresh occurrence of a CWV cut-off in an EUC demand model has more to do with the weather-demand conditions under which demand flattens off for the specific EUC not having previously occurred rather than indication of a notable change in the behaviour of the supply points of that EUC in the overall population. The purpose of averaging demand models from three years is to smooth out such year on year fluctuations caused by sample imperfections and the different weather experience of each year.

The presence of cut-offs affect ALP and DAF values over a limited number of days in the summer months. Where the cut-off value is very close to the maximum CWV of the relevant LDZ, the number of days affected can be very small. Thus, a smoothed model made up of three individual year models of which only one had a cut-off, would have a cut-off value that impacts the NDM profiles to a lesser extent than if two or all three constituent individual year models had a cut-off.

Spring 2017 Analysis

In 2017, there were 11 smoothed EUC models which exhibited a cut-off which hadn't the previous year, and 3 models where a cut off was absent having previously included one the previous year. These models accounted for 1.03% and 0.11% of NDM load respectively.

Below is an example of the cut-off results for one of the 11 EUC models mentioned above, which hopefully provides some additional clarity as to how models can change characteristics from one year to the next.

EUC Model: NW 03B

Note: As stated above when the model fails to exhibit a cut-off, whether 'best fit' or 'imposed' then the LDZ 'Max CWV' is used. For LDZ NW 16.08 is the 'Max CWV'.

2017 Analysis

Individual Year	Cut-Off	Value	
2014/15	None	16.08	
2015/16	None	16.08	
2016/17	Yes	14.68	This model had a 'best fit' cut-off characteristic because the mean squared error showed a significant improvement with a cut-off of 14.68 in place
_____			
Smoothed	Yes	15.61	This is the average of the 3 individual years cut-off values

2016 Analysis

Individual Year	Cut-Off	Value	
2013/14	None	16.08	
2014/15	None	16.08	
2015/16	None	16.08	
_____			
Smoothed	No	16.08	This is the average of the 3 individual years cut-off values

Appendix 1 and 2 shows examples of Annual Load Profiles (ALP) and Daily Adjustment Factors (DAF) from the Spring 2017 and Spring 2016 analysis, one with a CWV cut-off applied and one without a CWV cut-off.
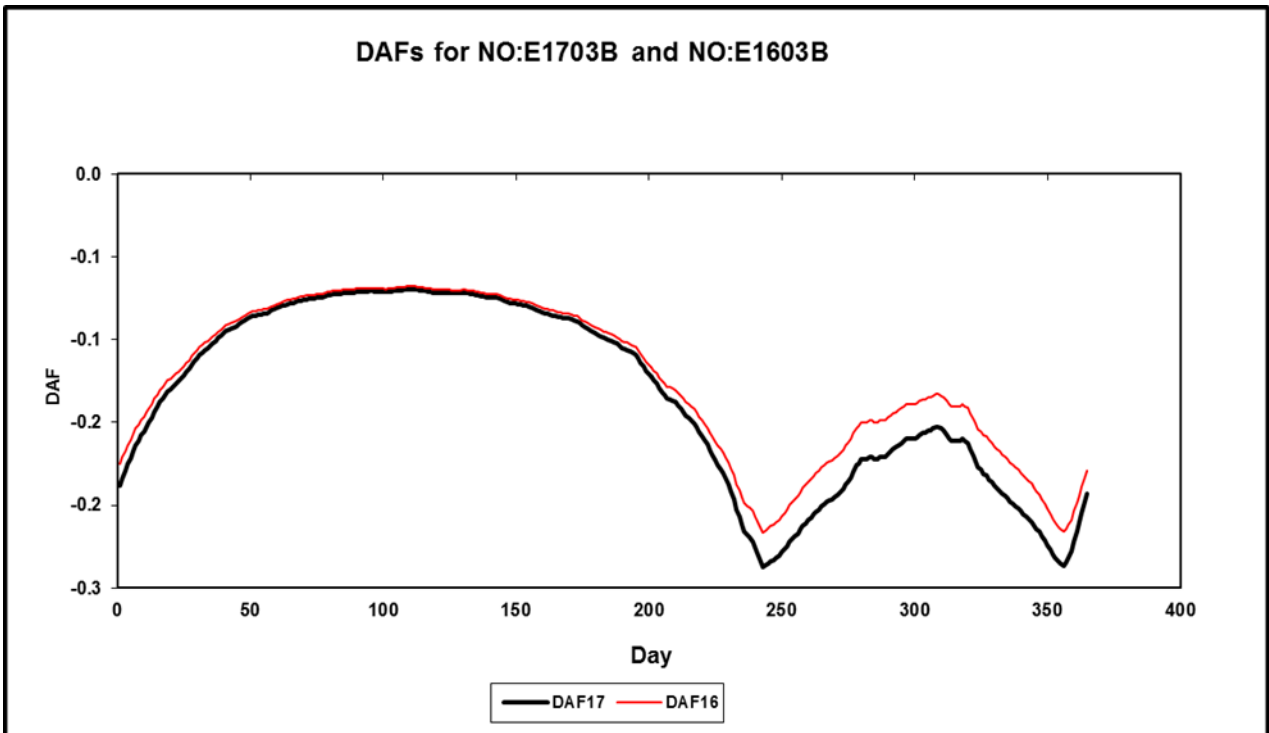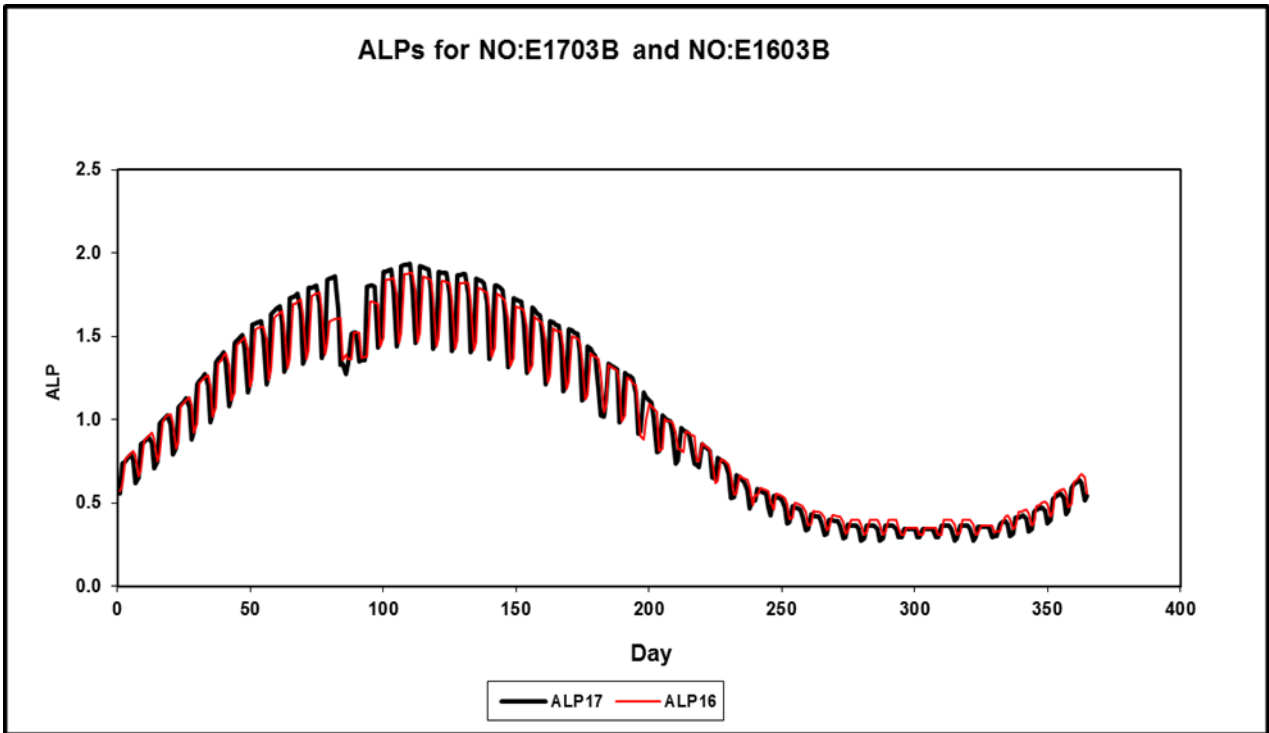
Conclusions:

The data collected from the three individual years and the subsequent smoothed model, decides whether a cut-off should be included or not. This is a key principle from the modelling and is why it is desirable to agree the approach before the process starts.

In most cases there is no human intervention applied or encouraged, that is outside of the agreed approach because in some cases (e.g. application of cut-offs) there is no clear black or white answer as to whether a cut-off should be applied or not.

If DESC are of the opinion that the approach taken is not producing the desired outcomes then it would probably be advisable to review the approach as set out above? Is this a potential adhoc work plan item to be discussed in the summer?

In addition it may be possible to improve the 'sign-posting' of those models which have 'flipped' during this year's analysis should DESC find this useful when reviewing the draft proposals in early June.

XOserve

ALPs for NO:E1703B and NO:E1603B

DAFs for NO:E1703B and NO:E1603B

Appendix 2: SC:E1705B & SC:E1605B – Example of Model without CWV cut-off (Spring 2017 and Spring 2016

ALPs for SC:E1705B and SC:E1605B

DAFs for SC:E1705B and SC:E1605B