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DESC Technical Workgroup Presentation of Models for 2016

22nd June 2016

Agenda

- Recap on Timetable
- Summary of 2016 Modelling and Smoothed Model Outcomes
- Summary of TWG responses to proposed Algorithms and Xoserve clarifications
- Conclusions and next steps

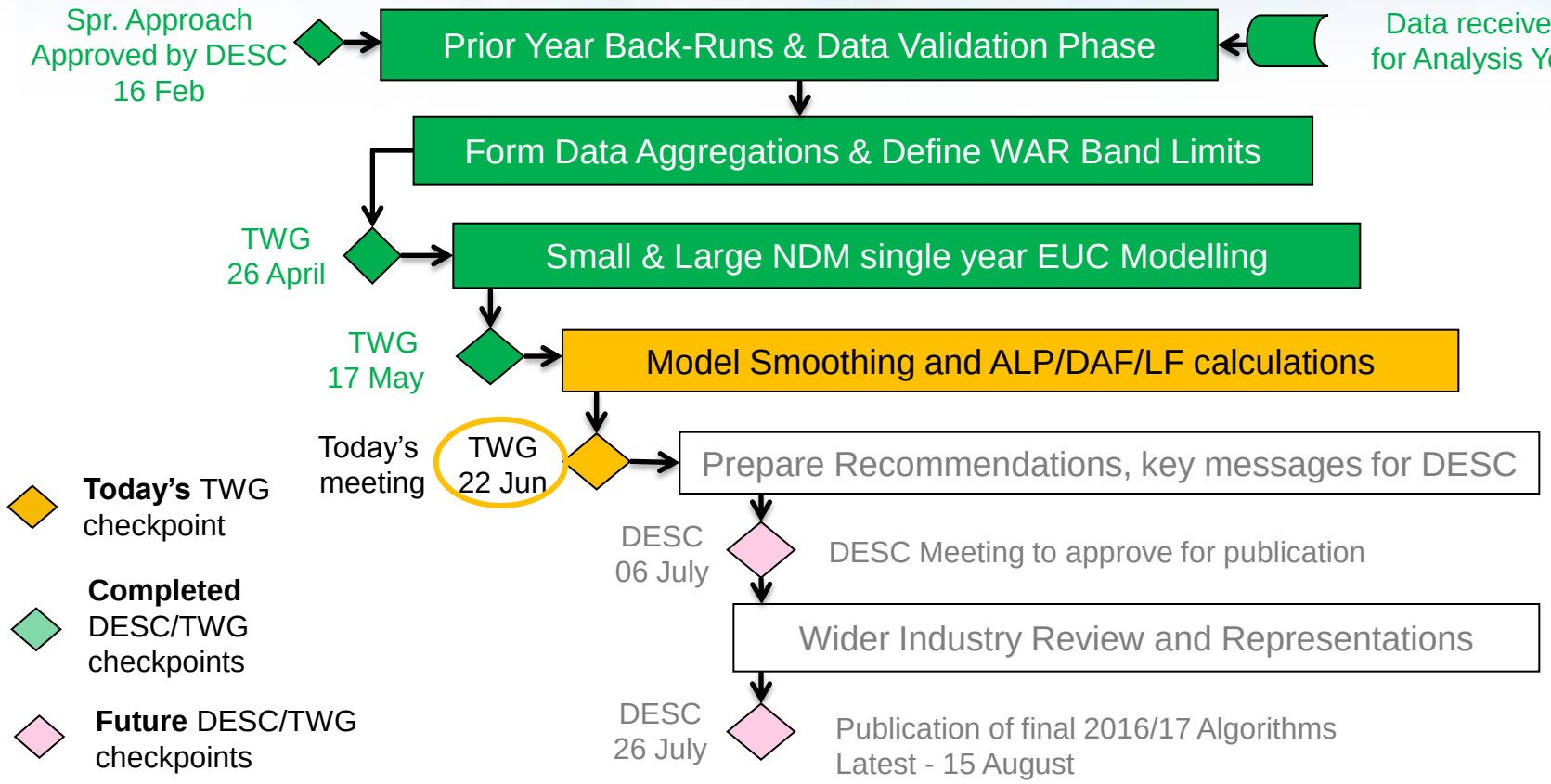
Objectives of this meeting

- Key objectives of this meeting:
  - Review TWG comments and agree any actions
  - Agree approach to presentation of proposals to DESC
- Required Outcome – TWG support for proposals prior to DESC review and discussion

Agreed 2016 Modelling Work plan

- Work plan for 2016 Modelling agreed at Feb DESC meeting
- Work plan aims to provide more transparency of process and introduce checkpoints for DESC/TWG review
  - There have been two TWG meetings to date – April and May
  - Further interaction via email
  - Third TWG checkpoint meeting today prior to handing over to DESC

Agreed 2016 Timetable



Summary of modelling

- Data aggregations & WAR Band limits agreed at April TWG meeting (26th)
- Single year modelling approved at May TWG meeting (17th)
- Model smoothing process followed in second half of May along with production of draft Derived Factors
  - Smoothed model outcomes summarised on slides 7 and 8
- Note: All modelling / output parameters produced using Composite Weather Variable (CWV) definitions and Seasonal Normal (SN) basis effective 01/10/2015

Small NDM: Smoothed Model outcomes

	2016	2015
Straight Models	62	49
Cut-Off Only	31	27
Summer Reductions Only	54	70
No Slope	0	0
Cut-Off and Reductions	9	10
Total Number of EUCs	156	156

- Small NDM represents approx. 89% of current NDM AQ

Large NDM: Smoothed Model outcomes

	2016	2015
Straight Models	181	190
Cut-Off Only	37	19
Summer Reductions Only	48	49
No Slope	0	0
Cut-Off and Reductions	7	15
Total Number of EUCs	273	273

- Large NDM represents approx. 11% of current NDM AQ

Summary of modelling cont.

- Modification 0432 (Project Nexus – Gas Demand Estimation, Allocation, Settlement and Reconciliation Reform) is due for implementation on 1st October 2016. This requires the Daily Adjustment Factor (DAF) to be expressed differently
  - DAFs have been calculated and published in the post 0432 format (ALPDAF16.txt) and current format (ALP_OLDDAF16.txt)
  - The Annual Load Profile (ALP) calculation remains unchanged

- Proposed End User Categories and Derived Factors were then published 3rd June on Xoserve's secure website
  - Slide 10 provides the revised folder structures put in place for this year as part of the review of NDM Algorithms booklet and supporting files

Where to find Demand Estimation data

- Revised Folder structure on secure website:

18. NDM Profiling and Capacity Estimation Algorithms

2016-17 Gas Year

1. Spring Approach Document

2. Demand Estimation Sample Data

3. Demand Estimation Parameters

a. End User Categories and Derived Factors

b. Demand Model Supporting Files

4. NDM Algorithms Booklet

- Folders highlighted green contain data published on 3rd June

TWG Responses / Comments on Proposals

- Email sent on 3rd June asked for feedback by no later than close of play 17th June in order to prepare for meeting on 22nd June

- British Gas have provided a response with comments on the proposals. Following slides takes these questions in turn

Modelling Background

- Profiles (ALPs, DAFs and LFs) are based on the parameters from the smoothed model
- Smoothed model exhibits ‘average characteristics’ from 3 individual years
- Each smoothed model includes 2 individual years which are the same as the previous year’s smoothed model with oldest year being replaced with the sample data from the new year
- The results for each individual model are dependent on the make up of the sample and their behaviour in that specific year alongside the weather conditions experienced
- Underlying reasons why the sample behaves in certain ways each year are not possible to explain
- The CWV intercepts (-C1/C2) provide a guide to how the weather sensitivity of the sample behaviours change (or not). Note: Higher CWV intercept = less weather sensitive
- The C1 and C2 parameters are provided in the Demand Model Supporting Files area
  - Smoothed model C1 and C2 can be viewed in EUCPAR16S.txt or EUC PAR16L.txt
  - Individual Years C1 and C2 can be viewed in MDLPARyy_16S.txt or MDLPARyy_16L.txt

British Gas - ALPS 1: WS:E03B

- WS:E03B – 2016 appears to be vertically “squashed” in comparison to 2015. Is there a reason for this shift in profile?

British Gas - ALPS 1: WS:E03B - Response

- The profile this year for WS:E03B is ‘flatter’ than last year's equivalent model i.e. less weather sensitive (less allocation in winter and more in summer)

- Table below shows CWV intercept values for the last 2 years smoothed model.
  Note: Higher intercept = less weather sensitive

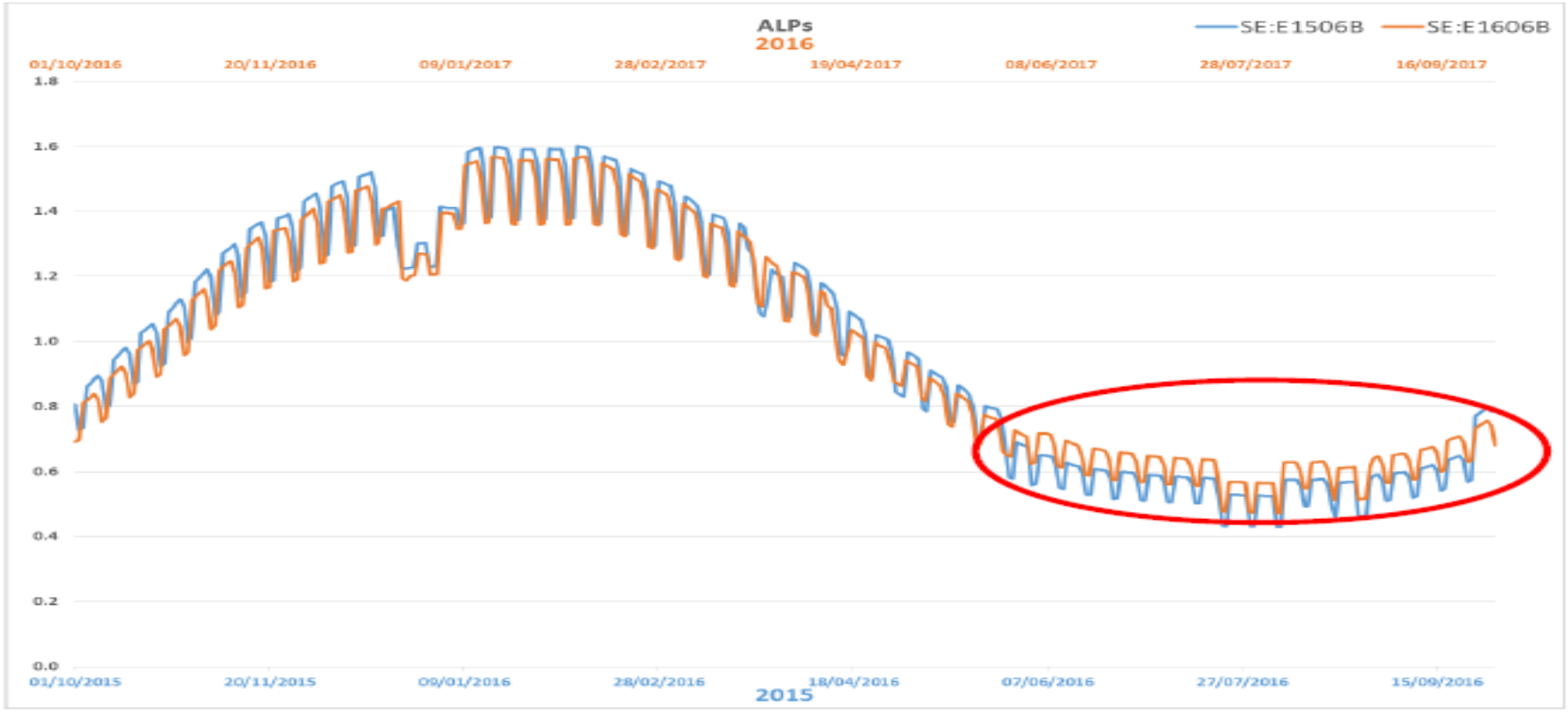
Analysis Year	2012/13	2013/14	2014/15	2015/16	Smoothed
2015	16.8	16.9	16.9	-	16.9
2016	-	16.9	16.9	18.9	17.5

- The new year that has been added (highlighted) is a flatter model compared to the previous 3 years. This change has contributed to the smoothed model becoming flatter

- Note: The new year is based on a sample of 20 supply points which was preferred by TWG to the combined model with SW – decision made by TWG at May meeting

British Gas - ALPS 2: SE:E06B

- SE:E06B – The 2016 curve starts below the 2015 curve and finishes above it. Is there a reason for this shift in profile?



British Gas - ALPS 2: SE:E06B - Response

- The profile this year for SE:E06B is ‘flatter’ than last year's equivalent model i.e. less weather sensitive (less allocation in winter and more in summer)

- This year's model does not have a summer reduction whereas last year's equivalent model did. Extract below is taken from the demand model supporting files:

  This year EUCHOL16L.txt and last year EUCHOL15L.txt

SE:E1606B ,HXNR,17,1.000	SE:E1506B ,HXWR,17,0.870
SE:E1606B ,HXNR,18,1.000	SE:E1506B ,HXWR,18,0.842
SE:E1606B ,HXNR,19,1.000	SE:E1506B ,HXWR,19,0.750
SE:E1606B ,HXNR,20,1.000	SE:E1506B ,HXWR,20,0.751

- The reductions applied to the summer period in last year's smoothed model are not present in this year's profile because the summer reduction criteria was not met (<10% reduction)

- Where a summer reduction is applied it will have the effect of increasing the ALP in the winter (needs to sum to 365)

British Gas - ALPS 3: SE:E07B

- SE:E07B – The 2016 curve starts above the 2015 curve and finishes below it. Is there a reason for this shift in profile? (SO:E07B & SO:E08B also show this).

British Gas - ALPS 3: SE:E07B - Response

- The profile this year for SE:E07B is ‘peakier’ than last year's equivalent model i.e. more weather sensitive (more allocation in winter and less in summer)

- Table below shows CWV intercept values for the last 2 years’ smoothed model.
  Note: Higher intercept = less weather sensitive

Analysis Year	2012/13	2013/14	2014/15	2015/16	Smoothed
2015	36.5	27.1	24.2	-	28.4
2016	-	27.1	24.2	24.7	25.3

- The old year that has been dropped (highlighted) is a flatter model compared to the 3 years used this year. This has contributed to the smoothed model becoming peakier

- SO:E07B has a similar scenario to above where a flatter model has dropped off compared with latest year which is peakier thus overall smoothed is peakier. SO:E08B ALP is derived from identical model to SO:E07B so same comment applies

- Note: 2016 smoothed model is first time that all 3 years for Bands 7 & 8 are combined (i.e. same model)

British Gas - ALPS 4: NT:E05W02

- NT:E05W02 – The first two weeks of May 2017 are approximately linear before returning to the profile. Is there a reason for this feature in the 2016 profile?

Holiday Codes Background

- Period highlighted is end of April to mid May which encompasses the first May Bank holiday.
- The linear line that has appeared in this period may be due to the holiday code factors.
- Holiday code agreed rules from modelling system for May Bank holiday are detailed below:

- First Bank Holiday in May (Holiday codes 9 and 10)

  From Saturday immediately preceding bank holiday, for 9 days in total. (Holidays runs from Saturday to Sunday).
  - Holiday Code 9:
    - First bank holiday in May
    - Saturdays in period above
    - Sundays in period above
  - Holiday Code 10:
    - Other days in period above.

(The holiday code factors can be found on the secure Xoserve website, file *EUCHOL16L* in Folder '*18 NDM Profiling and Capacity Estimation Algorithms/2016-17 Gas Year/3. Demand Estimation Parameters/b. Demand Model Supporting Files)*

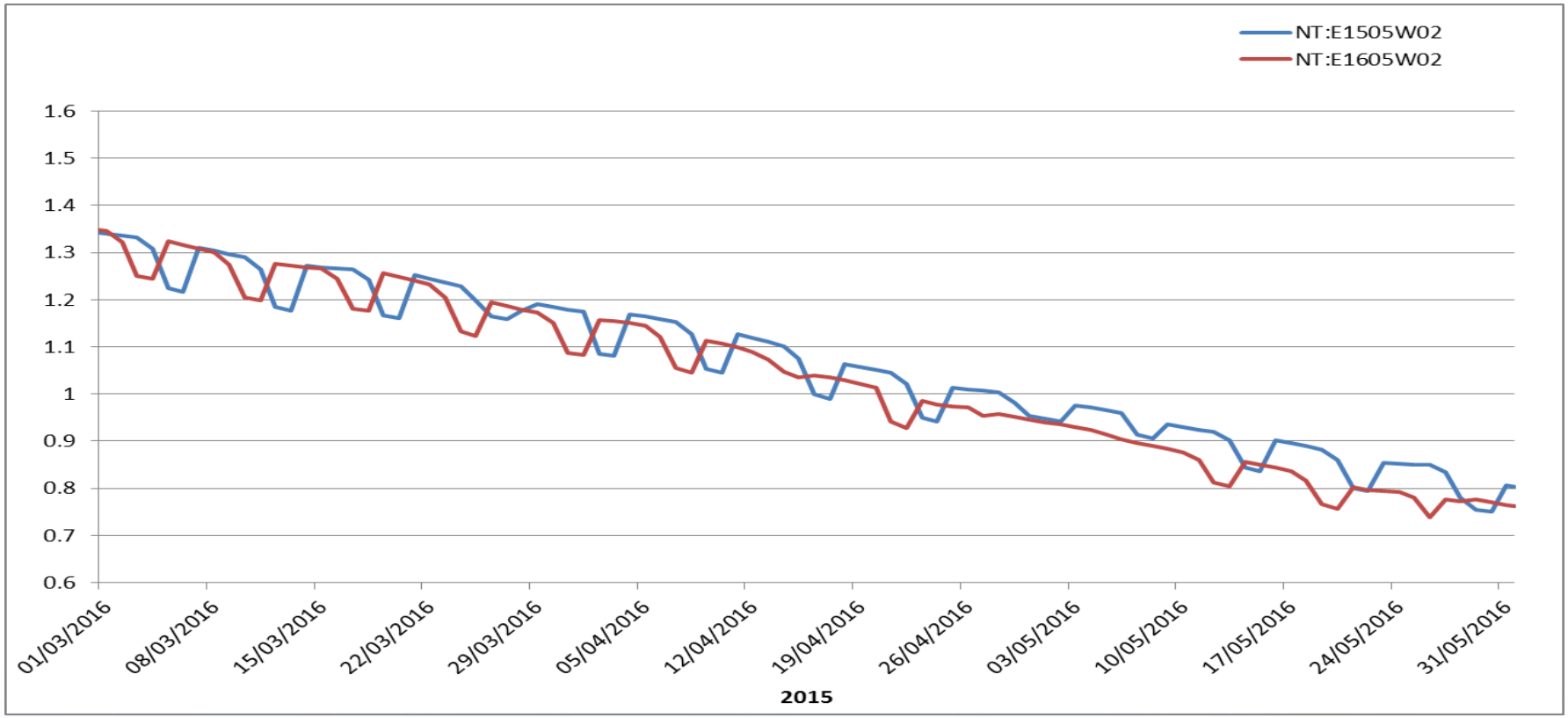
British Gas - ALPS 4: NT:E05W02 - Response[21]

- The period that appears to be linear is between 24th April 2017 – 11th May 2017.
- This includes the first May bank holiday period.
- The table opposite shows the holiday factors that have been applied where applicable within that period.
- From observing these values it shows that there is almost no reduction applied on the weekends, hence why we are not seeing the typical weekend effects on the chart.
- The Weekend Factor shows the reduction that would have been applied if it was not a holiday.

Date	Day	Holiday Code	Holiday Factor 2015	Holiday Factor 2016	Weekend Factor
24/04/2017	Mon				
25/04/2017	Tue				
26/04/2017	Wed				
27/04/2017	Thu				
28/04/2017	Fri				0.986
29/04/2017	Sat	9	0.961	0.997	0.936
30/04/2017	Sun	9	0.961	0.997	0.934
01/05/2017	Mon	9	0.961	0.997	
02/05/2017	Tue	10	1	1	
03/05/2017	Wed	10	1	1	
04/05/2017	Thu	10	1	1	
05/05/2017	Fri	10	1	1	0.986
06/05/2017	Sat	9	0.961	0.997	0.936
07/05/2017	Sun	9	0.961	0.997	0.934
08/05/2017	Mon				
09/05/2017	Tue				
10/05/2017	Wed				
11/05/2017	Thu				

British Gas - ALPS 4: NT:E05W02 - Response[22]

The chart below shows the same ALP but on a smaller scale.



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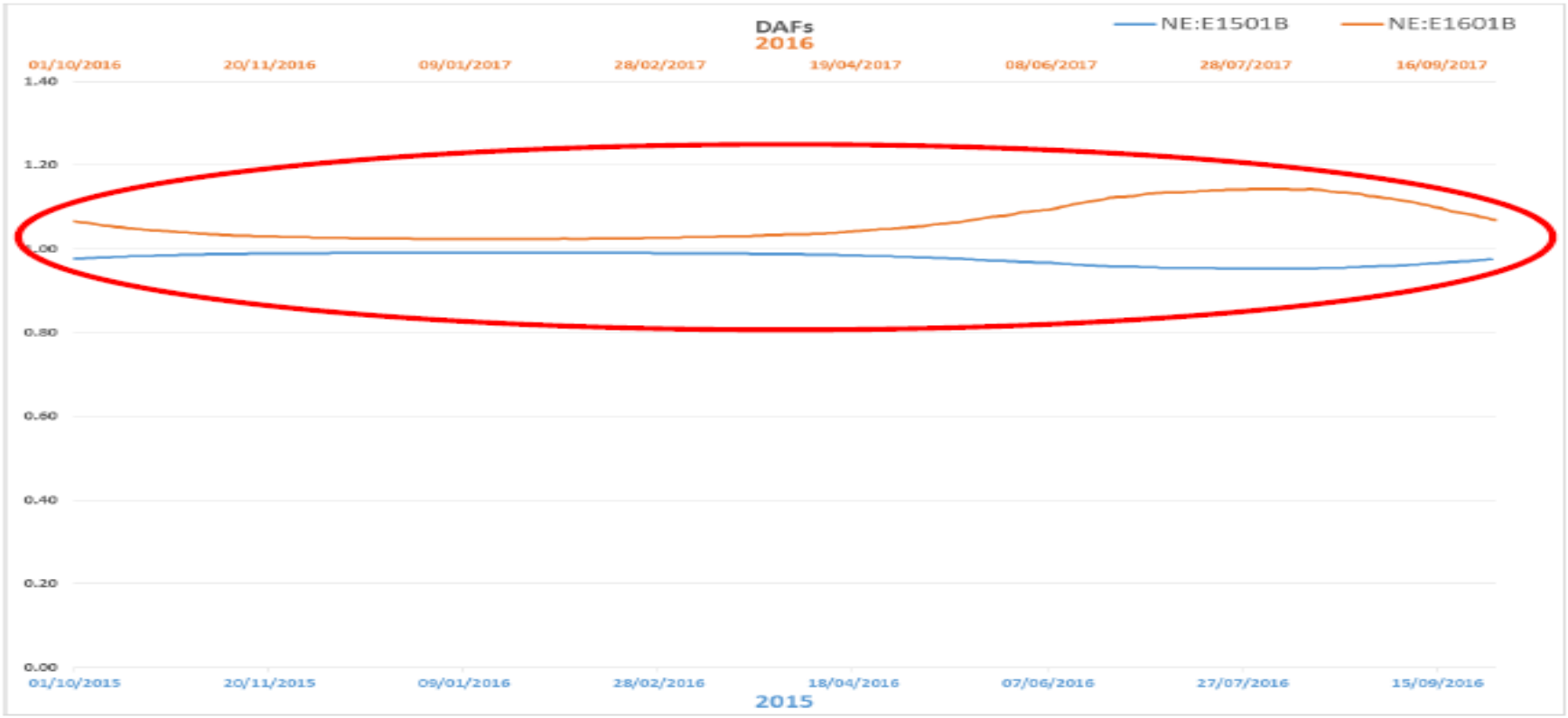
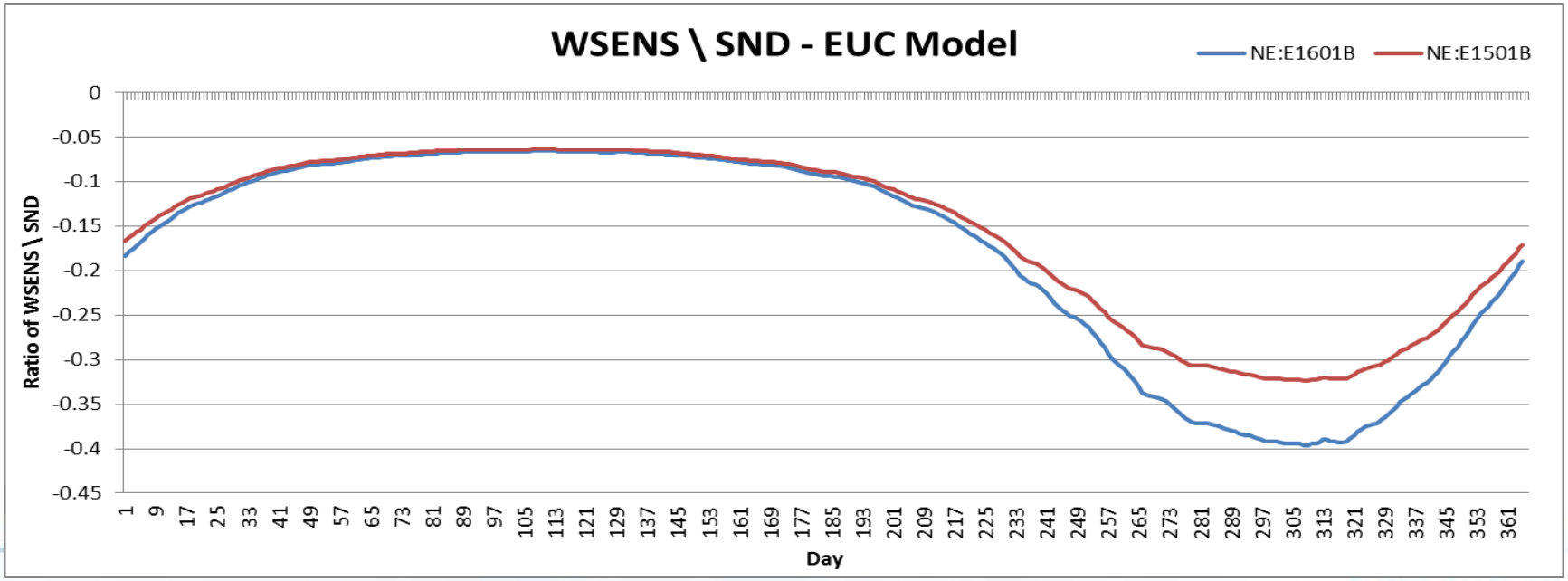
British Gas - DAFs 1: NE:E01B

- NE:E01B – The profiles are inverted between 2015 and 2016. Is there a reason why these profiles are the reverse of 2015? (NO:E02B, WS:E02B & EA:E03B also show this).



British Gas - DAFs 1: NE:E01B – Response 1

- The answer to this question is twofold, firstly related to several of the characteristics of the EUC model and secondly the EUC relationship to the aggregate NDM Model
- Firstly the model has become more weather sensitive with a CWV intercept of 18.0 (2015: 18.6)
- The following chart compares the EUC model for 2015 and 2016. The relationship WSENs\SND is used (this is the numerator in the DAF formula)



DAFs Background

- The pre Nexus version of DAFs has been used in the queries. This is calculated by the formula:

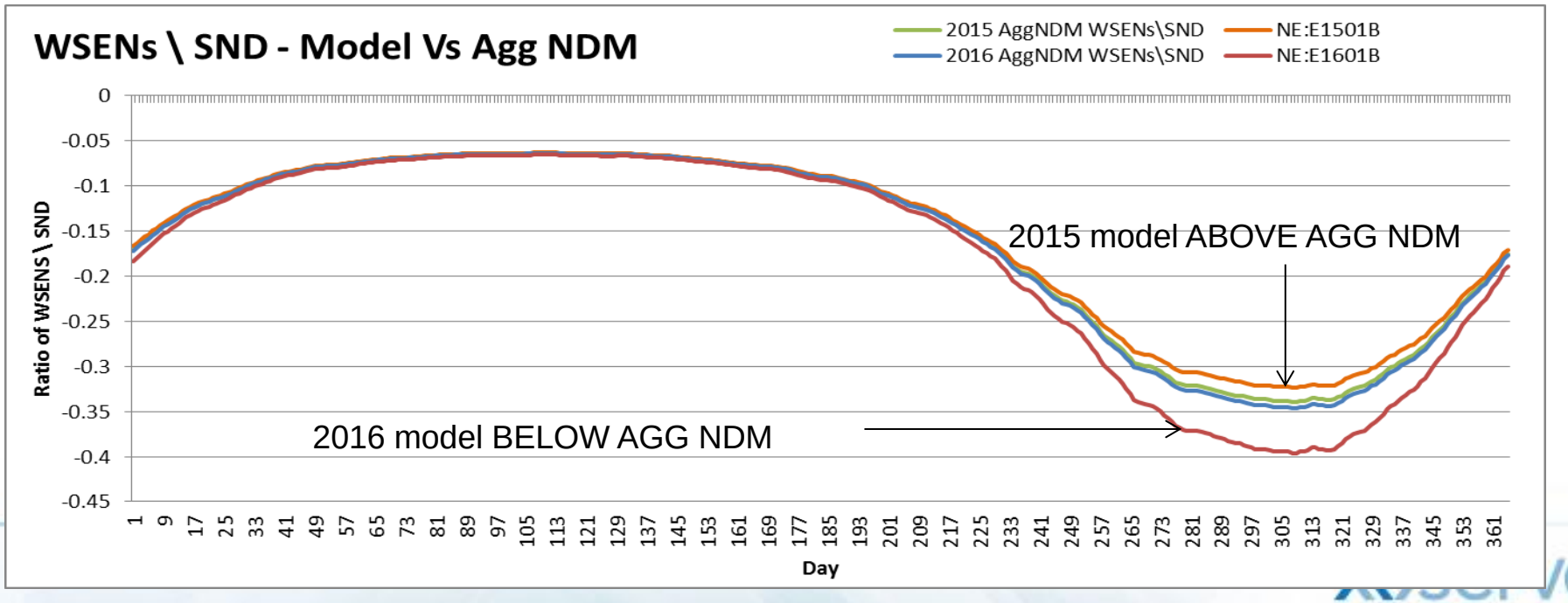
- $DAF_t = \frac{WSENS_t / SND_t \text{ (for EUC)}}{WSENS_t / SND_t \text{ (for aggregate NDM in LDZ)}}$ where

  - The numerator represents the WSENS / SND ratio for the EUC Model
  - The denominator represent the WSENS / SND for the aggregate NDM model for the LDZ

- Pre Nexus DAFs have positive values.
- When the DAF is one it means the EUC Model has the same sensitivity as the LDZ aggregate NDM Model
- Values higher than one suggest the model is more weather sensitive than the aggregate NDM LDZ position
- The “mirror image” is typical where the model has switched from being less sensitive than the EUC average to being more sensitive than the EUC average (or vice versa)

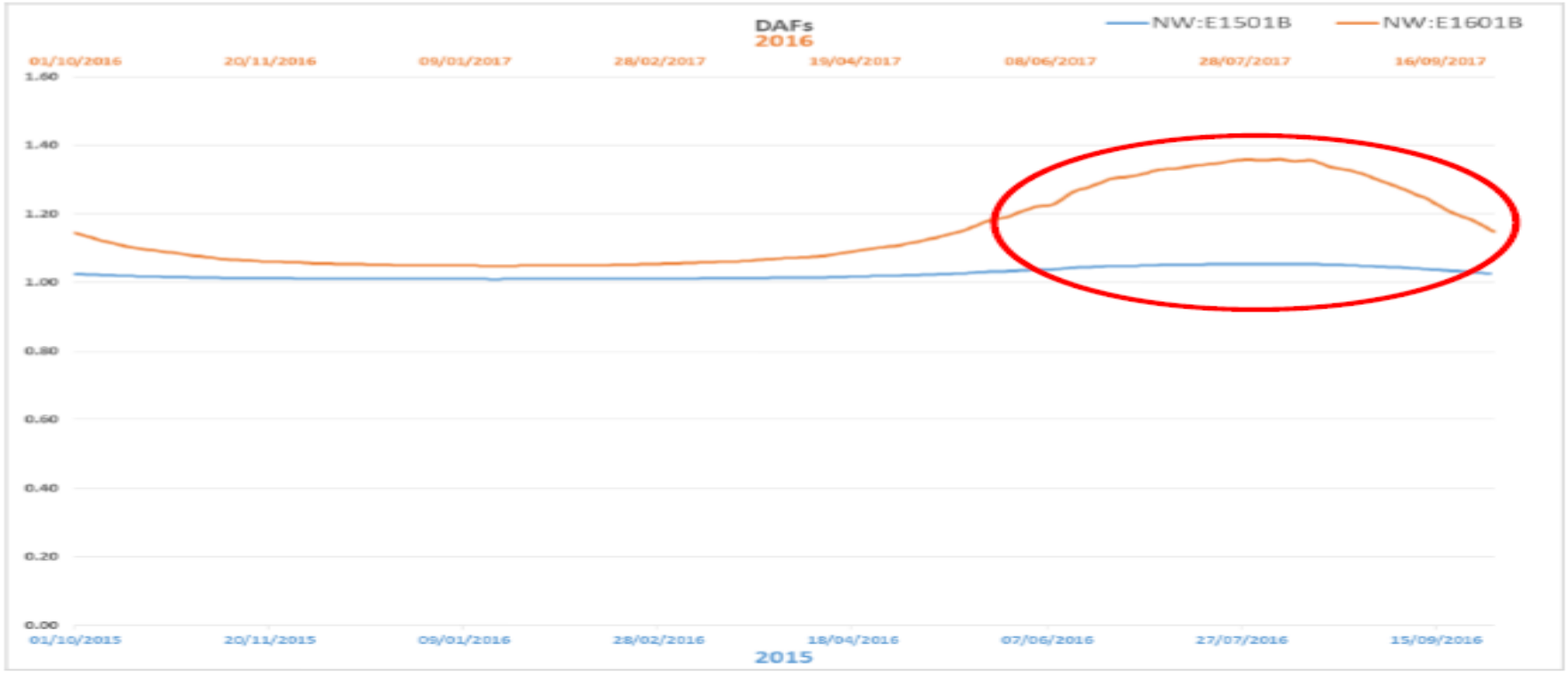
British Gas - DAFs 1: NE:E01B – Response 2

- The second part to this answer is the relationship of the EUC Model to the aggregate NDM model.
- The chart below plots individually the numerator and denominator from the DAF formula for both years.
- The aggregate NDM model for the two years are the lines in the middle. Either side are the respective numerators for the 2015 and 2016 NE 01B models. These when divided by the denominator causes the DAF plot to invert.



British Gas - DAFs 2: NW:E01B

- NW:E01B – The end of the 2016 profile shows a significant “hump” that is not present in 2015. is there a reason why these profiles are more exaggerated at the ends? (SC:E01B, WS:E01B, WN:E01B, LC:E01B, LS:E01B, LT:E01B, LO:E01B, LW:E01B, SE:E06W04 & SO:E06W04 also show this).



British Gas - DAFs 2: NW:E01B - Response

- This year's smoothed model does not have a Summer Reduction (SR) whereas last year's equivalent model did. Extract below is taken from the demand model supporting files:

  This year EUCHOL16S.txt and last year EUCHOL15S.txt

NW:E1601B ,HINR,17,1.000	NW:E1501B ,HIWR,17,0.892
NW:E1601B ,HINR,18,1.000	NW:E1501B ,HIWR,18,0.907
NW:E1601B ,HINR,19,1.000	NW:E1501B ,HIWR,19,0.922
NW:E1601B ,HINR,20,1.000	NW:E1501B ,HIWR,20,0.927

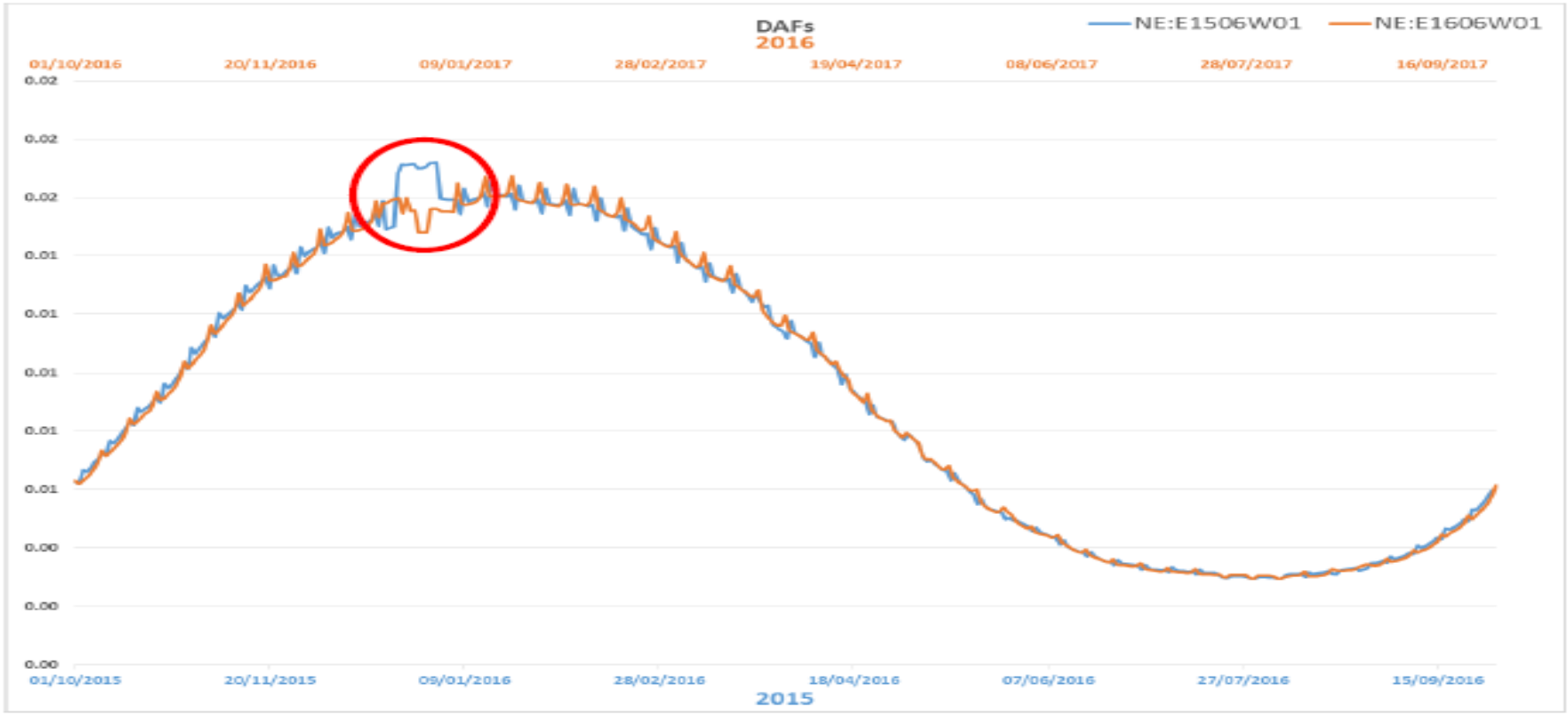
- Summer reduction period is defined as all non-holiday days over the period from the start of the Spring bank holiday (Sunday immediately preceding bank holiday) to the last Sunday in September i.e. the period circled on the chart

- No summer reductions means greater weather sensitivity in summer which can be seen in the DAF (relative weather sensitivity compared to the overall LDZ)

- The same change in model outcomes, i.e. SR to No SR, has happened this year for SC:E01B, WS:E01B, WN:E01B and Scottish Independents (same model as SC)

British Gas - DAFs 3: NE:E06W01

- NE:E06W01 – Christmas appears to be modelled differently from 2015 to 2016. Is there a reason for this? (NO:E06W04 also shows this).



Holiday Codes Background

Christmas/New Year (Holiday codes 1, 2, 3, 4 and 5)

Holiday period starts on the Monday before 25th December (but if 25th December falls on a Monday, Tuesday or Wednesday, starts on the Friday before 25th December) and ends on the first Friday on or after the second New Year bank holiday in Scotland.

Holiday Code 1:

- 25th December

Holiday Code 2:

- 26th December, January 1st and any remaining bank holidays (except second Scotland New Year bank holiday) and any other Saturdays and Sundays in the period.

Holiday Code 3:

- Any remaining Mondays to Fridays between 24th December and day before second Scotland New Year bank holiday inclusive .

Holiday Code 4:

- Remaining days before 24th December.

Holiday Code 5:

- Remaining days (will always include second Scotland New Year bank holiday).

British Gas - DAFs 3: NE:E06W01 - Response

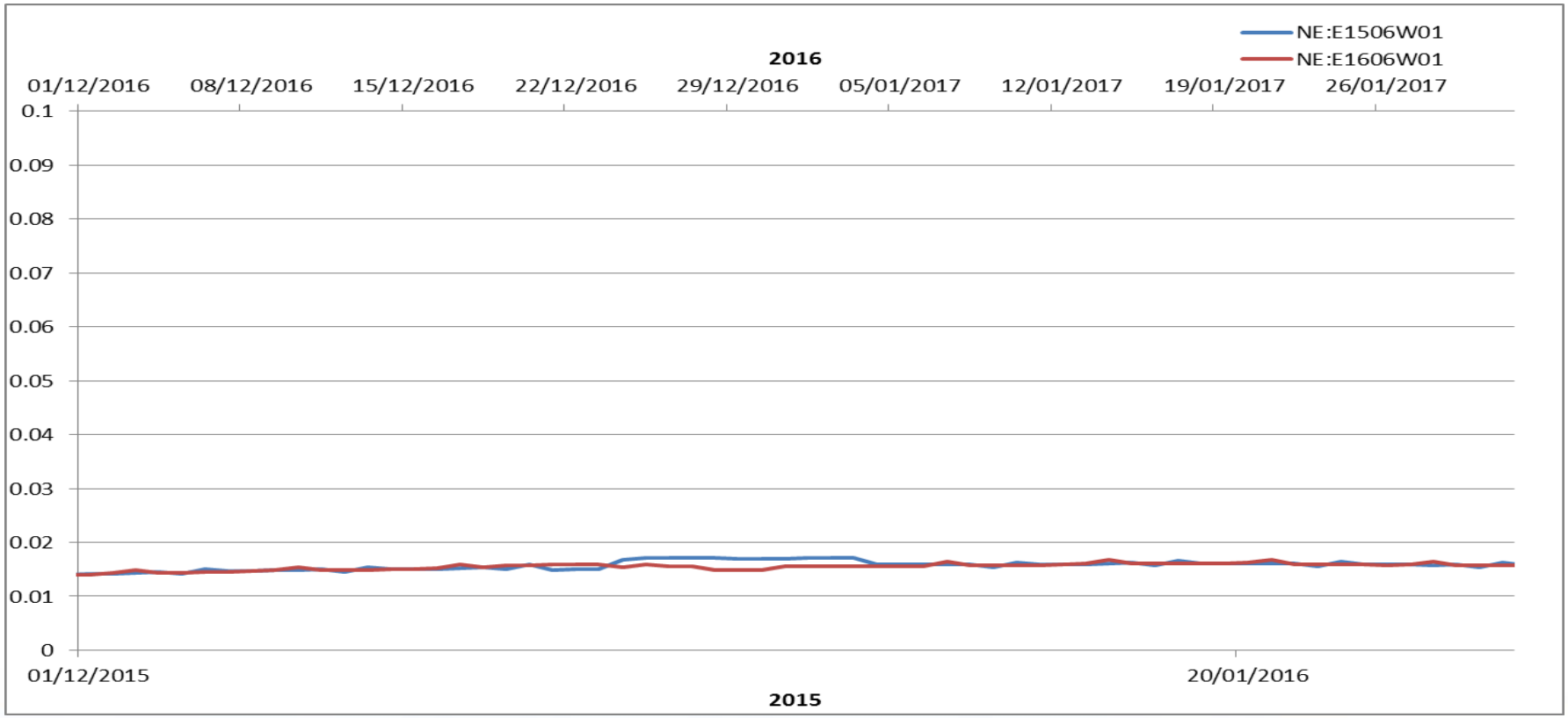
- The Christmas period highlighted on the chart covers the date range of 24th Dec 2016 to 3rd Jan 2017.
- The modelling has been done as per the spring approach 2016, which is in line with last year's approach.
- The DAF is then derived from the EUC and aggregate NDM demand model, which again has been calculated in the same way as last year.
- The scale on the chart is very small.
- Highlighted in the tables opposite are those days that had a different holiday code in comparison to last year
- The second table displays the Holiday Factors used in 2015 and 2016.

Date	Day of Week	Holiday Code 2015	Holiday Code 2016	DAF 2016 vs DAF 2015
24/12/2016	Sat	2	3	-0.001
25/12/2016	Sun	1	1	-0.001
26/12/2016	Mon	2	2	-0.002
27/12/2016	Tue	2	2	-0.002
28/12/2016	Wed	3	2	-0.002
29/12/2016	Thu	3	3	-0.002
30/12/2016	Fri	3	3	-0.002
31/12/2016	Sat	2	3	-0.001
01/01/2017	Sun	2	2	-0.002
02/01/2017	Mon	2	2	-0.002
03/01/2017	Tue	5	2	-0.002

Holiday Code	Holiday Factor 2015	Holiday Factor 2016
1	0.125	0.113
2	0.209	0.194
3	0.253	0.245
4	0.519	0.523
5	0.541	0.586

British Gas - DAFs 3: NE:E06W01 - Response[32]

The chart below shows the same DAF but on a larger scale.



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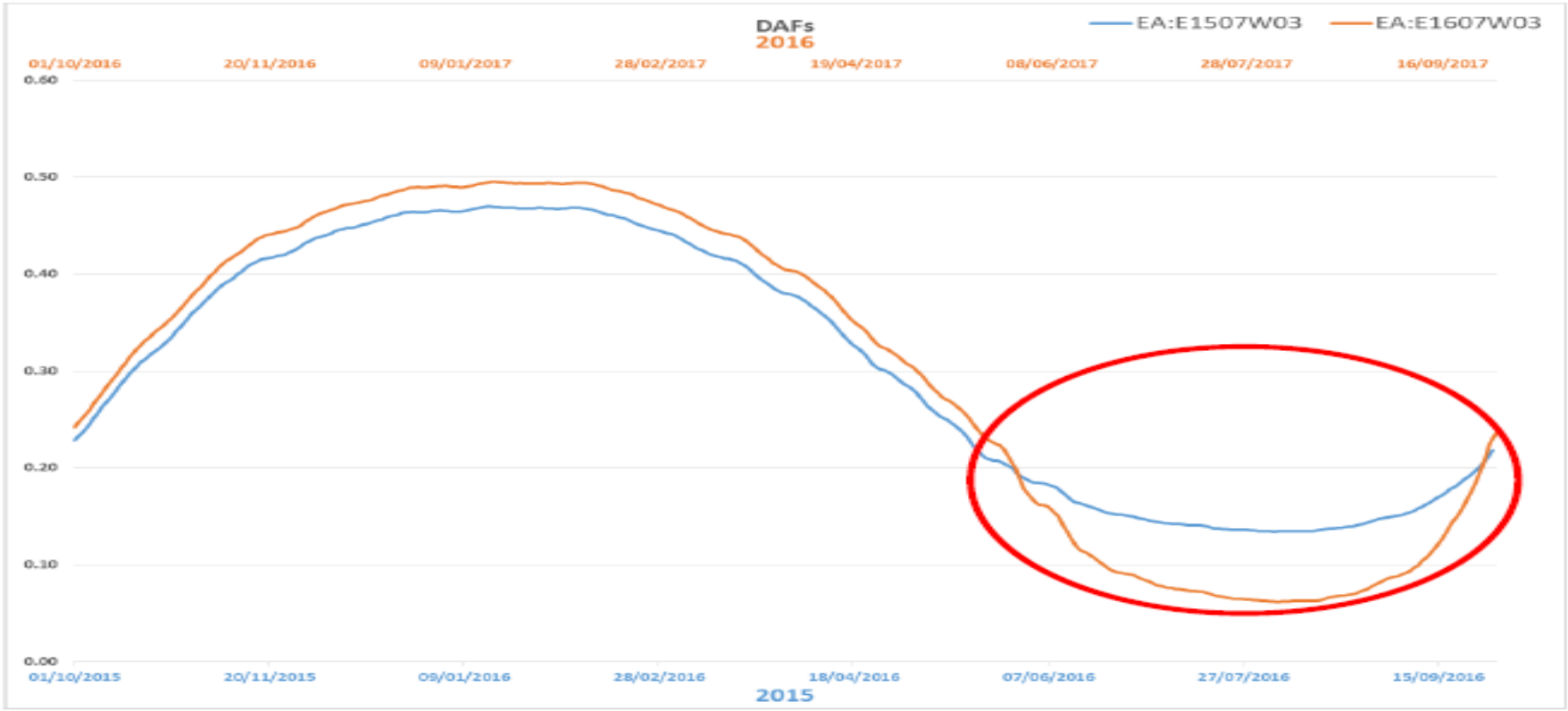
British Gas - DAFs 4: EA:E07W03

- EA:E07W03 – the 2016 curve dips significantly at the end compared to 2015. is there a reason for this change in profile? (NT:E07W03, SE:E07W03, SO:E07W03, WS:E07W03, EA:E08W03, NT:E08W03, SE:E08W03, SO:E08W03 & WS:E08W03 also show this).



British Gas - DAFs 4: EA:E07W03 - Response[34]

- The distinct shape of the DAF profile for EA:E07W03 between the two profiles reflects whether the model has exhibited “cut offs” for a particular year

- 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

- This year’s proposed model does have a cut off, with a value of 16.2 whereas the equivalent model last year did not have a cut off (default of 99). The applied cut-off and its impact to the weather sensitivity in the DAF is the reason for the “dip” observed between 2015 and 2016

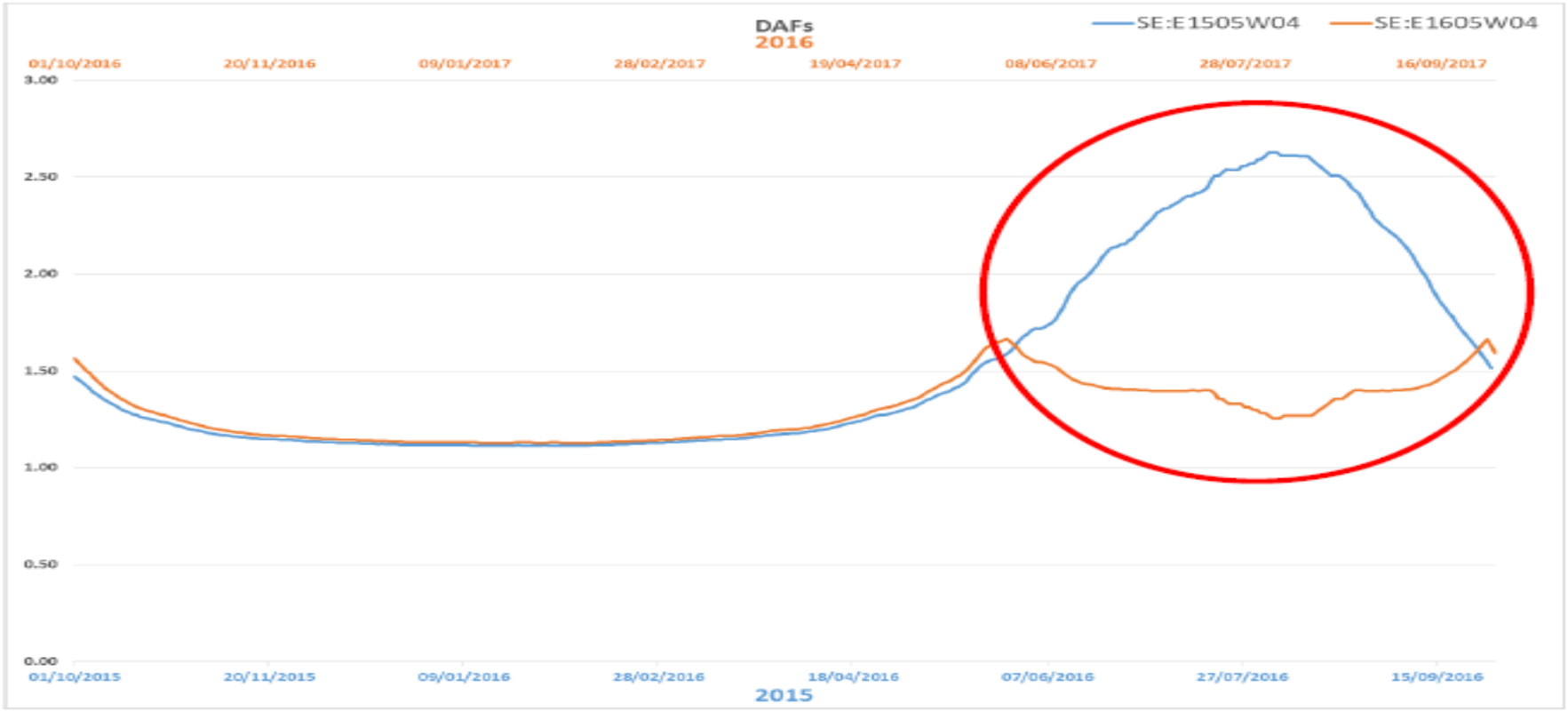
- See the following extracts from the parameter files published on Xoserve website

  EUCPAR15L.TXT (last year)
  EA:E1507W03, 5694.8, -162.7, **99.0**, 145.8, 0.639

  EUCPAR16L.TXT (this year)
  EA:E1607W03, 7448.0, -222.6, **16.2**, 199.3, 0.625

British Gas - DAFs 5: SE:E05W04

- SE:E05W04 – the 2016 curve is inverted at the end compared to the 2015 curve. Is there a reason for this change in profile. (NO:E06W04 also shows this).



British Gas - DAFs 5: SE:E05W04 - Response

- The distinct shape of the DAF profile for SE:E05W04 between the two profiles reflects whether the model has exhibited “cut offs” for a particular year.

- This year’s proposed model does have a cut off, with a value of 16.3 whereas the equivalent model last year did not have a cut off (default of 99). See the following extracts from the parameter files published on Xoserve website:

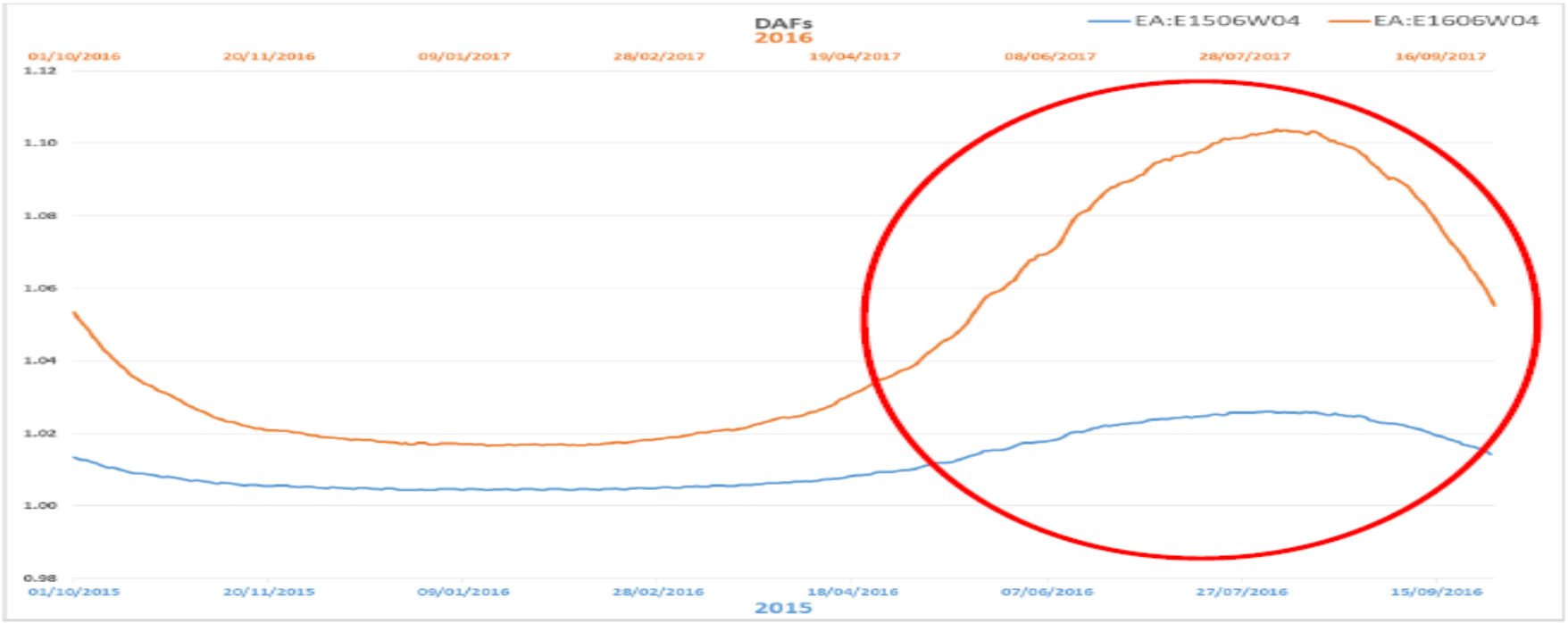
- Output from parameter files: **EUCPAR15L.TXT**
  SE:E1505W04, 1663.2, -96.4, **99.0**, 41.6, 0.749

- And **EUCPAR16L.TXT**
  SE:E1605W04, 1830.2, -106.7, **16.3**, 42.0, 0.772

- This example of a DAF also demonstrates the phasing in of the weather sensitivity to avoid sudden step change in DAF values to zero where the seasonal normal CWV reaches the cut off.
- This is described in section 9 of the NDM Booklet.

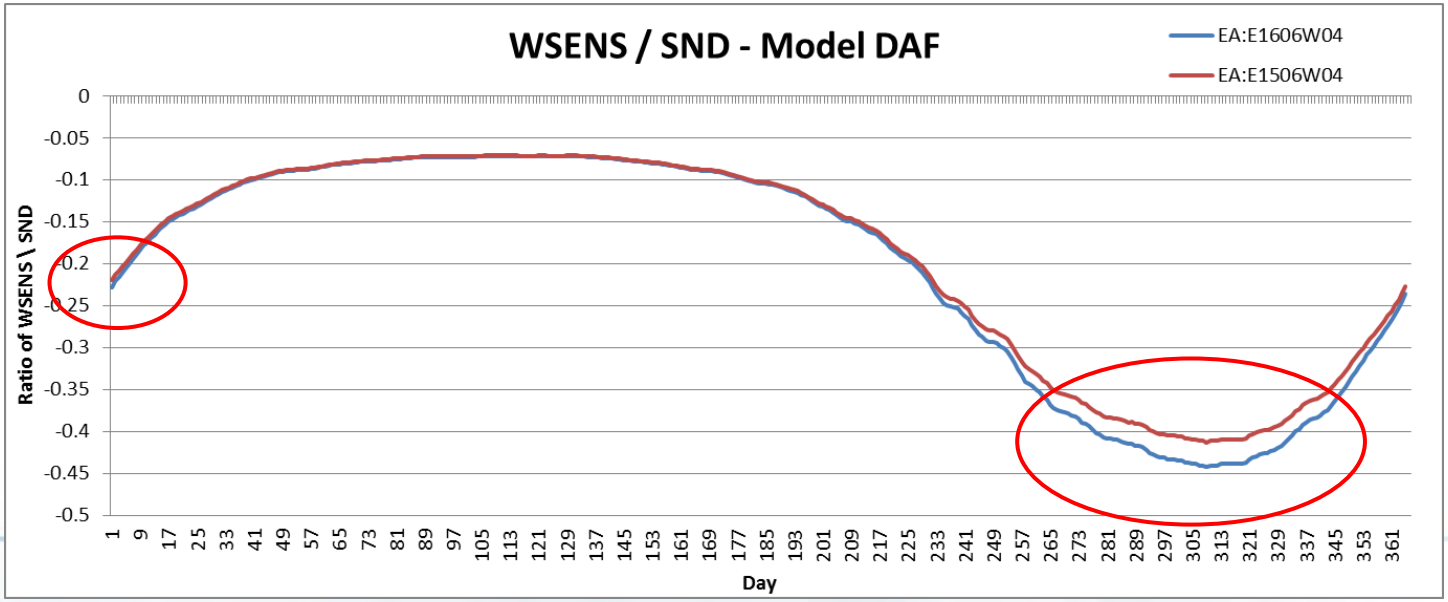
British Gas - DAFs 6: EA:E06W04

- EA:E06W04 – the spread between 2015 and 2016 seems large and there is a larger hump in the 2016 profile. Is there a reason for the large gap between the profiles? (NT:E06W4, NW:E06W04, WN:E06W04, EA:E07W04, EM:E07W04, NT:E07W04, SE:E07W04, SO:E07W04, SW:E07W04, WM:E07W04, EA:E08W04, NT:E08W04, SE:E08W04, SO:E08W04, SW:E08W04 & WM:E08W04 also show this).



British Gas - DAFs 6: EA:E06W04 – Response[38]1

- Comparison of the 2015 vs the 2016 model for this EUC shows the following characteristics:
  - Both models have no cut offs
  - Both have summer reductions which are at a comparable level (0.757 in 2015 vs 0.758 in 2016)
  - 2016 model is more weather sensitive than 2015 with a CWV intercept of 18.72 compared to 18.88 in 2015.
  - The effect of the difference in the models, in terms of WSENs \ SND ratio can be seen in the following chart. Generally the ratio is comparable in both years' models but 2016 smoothed showed a ratio that was further away from zero.



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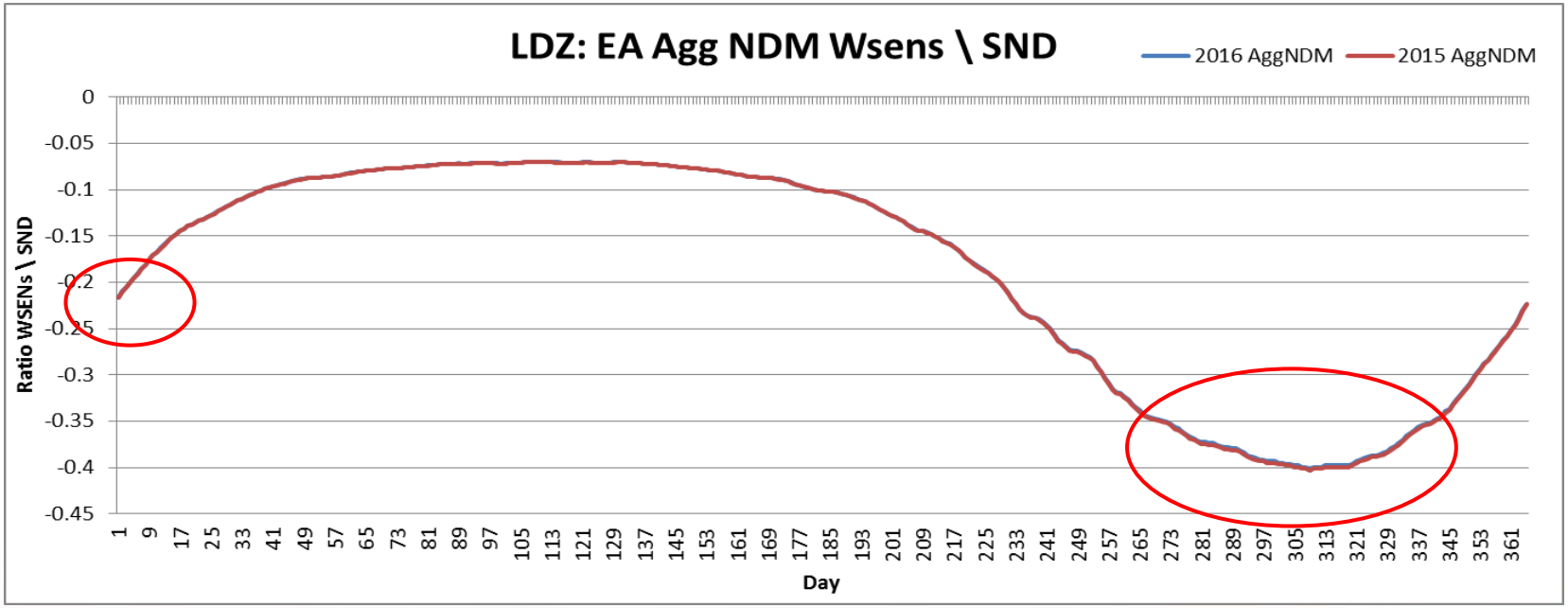
British Gas - DAFs 6: EA:E06W04 – Response

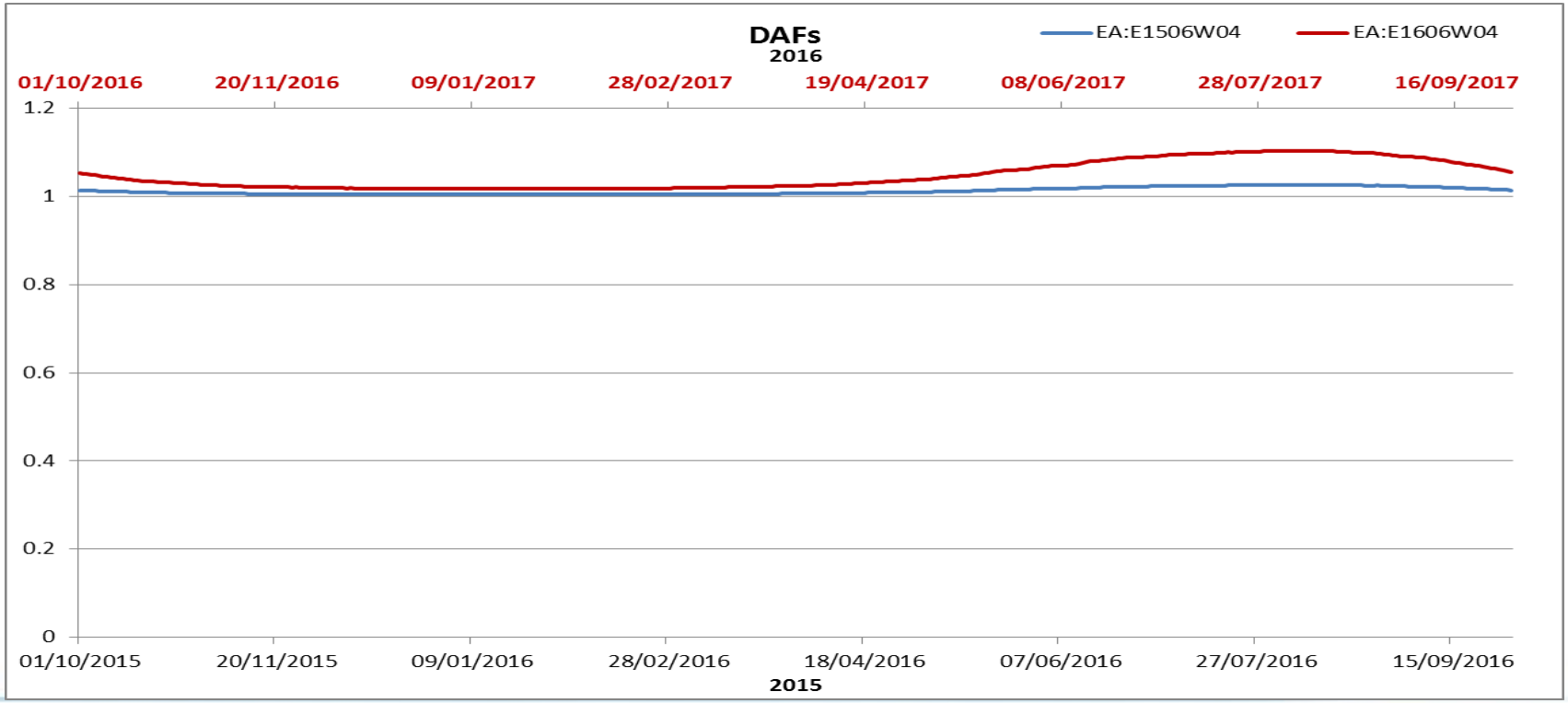
2

- As with question DAF 1 the relationship with aggregate NDM model is influencing the pattern.
- In the EUC model relationship for both years, day 1 (1st October in each gas year) looks on top of each other:
- Below is the Aggregate NDM Model for both year for this LDZ. The relationship is consistent both years.



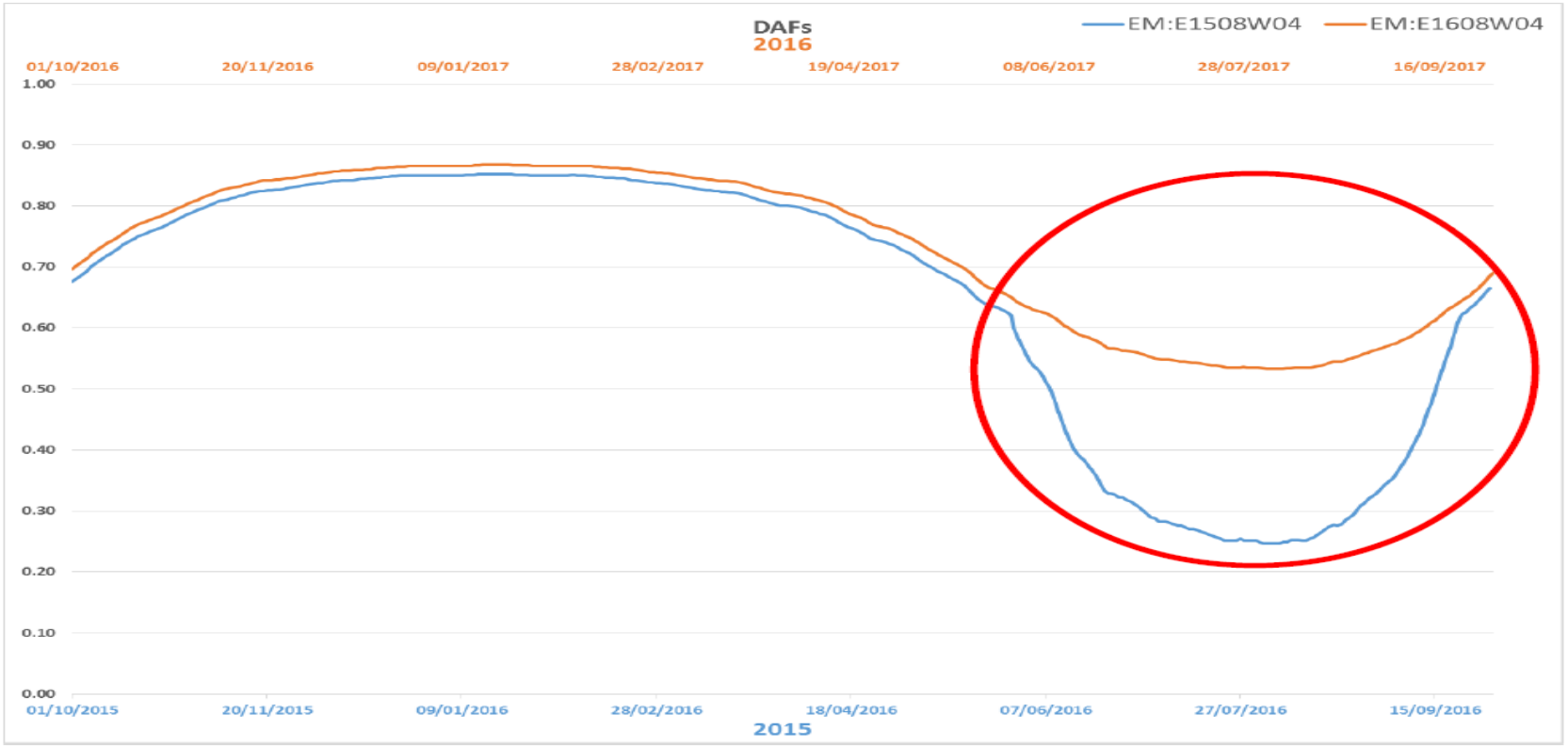
British Gas - DAFs 6: EA:E06W04 – Response 3

- Referring back to the original chart
- The scale has been adjusted to really focus in on what are minute differences.
- The chart below shows the same DAFs but with a larger scale which suggests the “hump” is not as material as the original chart.



British Gas - DAFs 7: EM:E08W04

- EM:E08W04 – The curve for 2016 does not have the “bucket” that is part of the 2015 curve. Is there a reason for this change in profile? (NO:E08W04, NW:E08W04 & WN:E08W04 also show this.)



British Gas - DAFs 7: EM:E08W04 - Response

- The distinct shape of the DAF profile for EM:E08W04 between the two profiles reflects whether the model has exhibited “cut offs” for a particular year.

- 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.

- This year’s proposed model does not have a cut off (default of 99) whereas the equivalent model last year did have a cut off, with a value of 14.9. See the following extracts from the parameter files published on Xoserve website:

- Output from parameter files: EUCPAR15L.TXT
  EM:E1508W04, 9397.2, -468.9, **14.9**, 229.2, 0.670

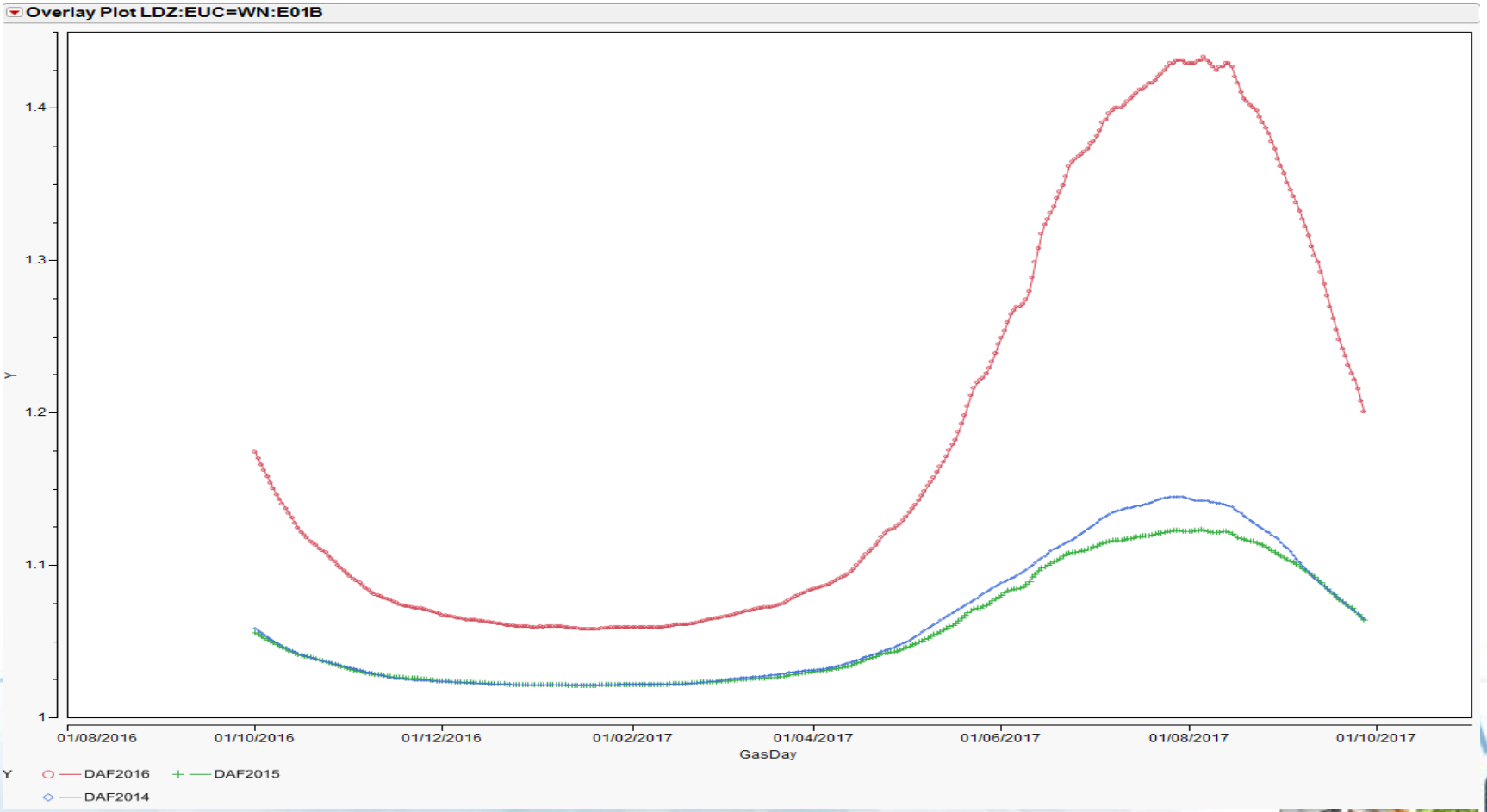
- And EUCPAR16L.TXT
  EM:E1608W04, 5309.7, -270.0, **99.0**, 148.8, 0.640

E.ON Questions on the models

- E.ON have provided a response with two questions on the proposals. Following slides takes these questions in turn

E.ON - DAF High levels for WN:E01B

- This was one of a few DAFs that appeared to have abnormally high levels as well as a large spike going into the summer for 2016/2017 that hasn't appeared in previous years. What causes the change in behaviour for 2016/2017?

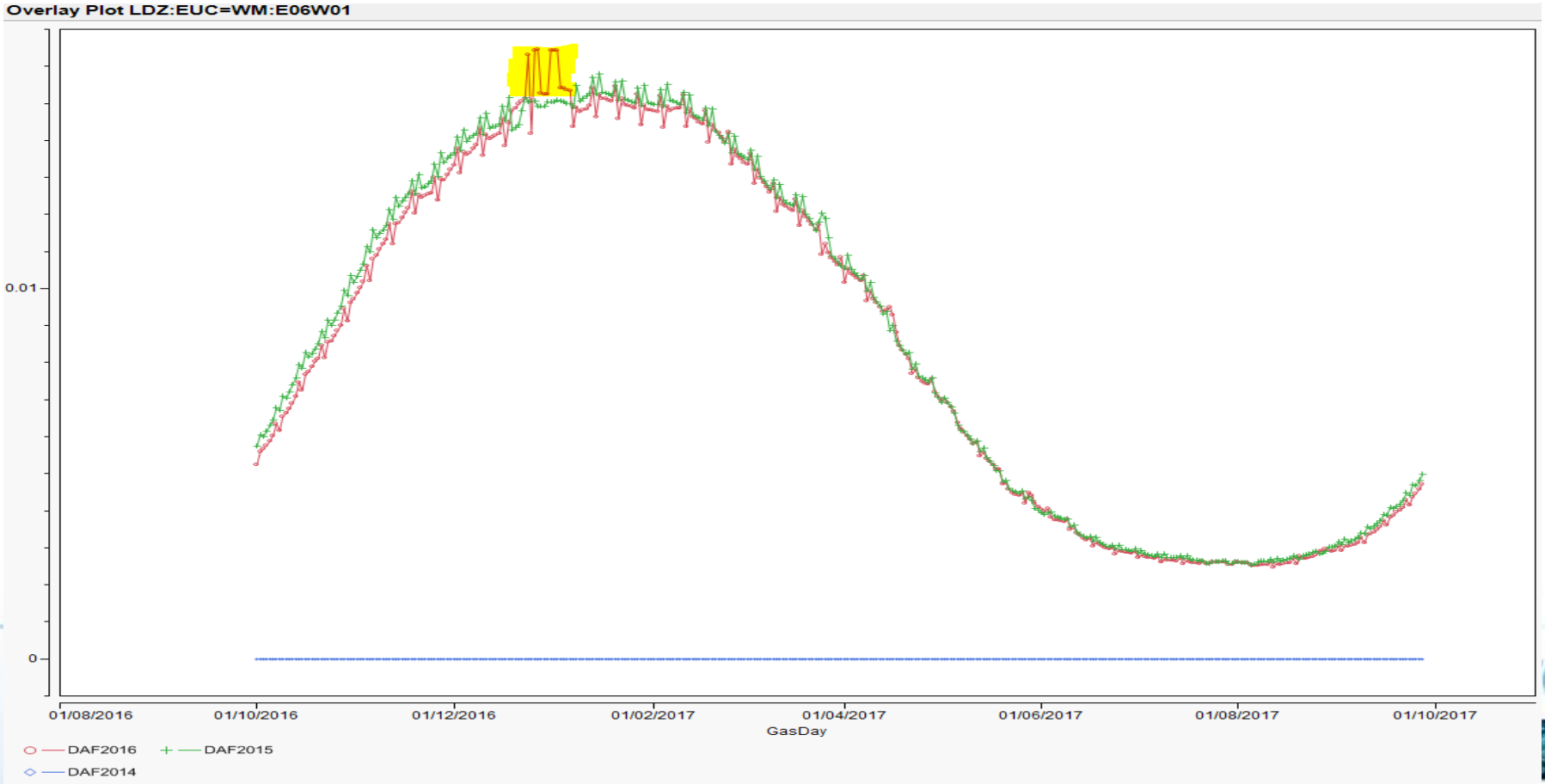


E.ON - DAF High levels for WN:E01B - Response[45]

- As with British Gas DAF 2 Query, this year's smoothed model does not have a Summer Reduction (SR) whereas last year's equivalent model did.
- No summer reductions means greater weather sensitivity in summer which can be seen in the DAF (relative weather sensitivity compared to the overall LDZ)
- NW and WN are modelled together, therefore the holiday code parameters are the same for both 01B models.

E.ON - Unusual DAF Christmas spikes for WM:E06W01

- Though the levels are small there are some unusual spikes around Christmas/New Year period for 2016/2017 as they haven't appeared in previous years. Additionally there are very few comparable EUC's that have these spikes for this time period. What's the reasoning behind these spikes?



E.ON - Unusual DAF Christmas spikes for WM:E06W01 - Response

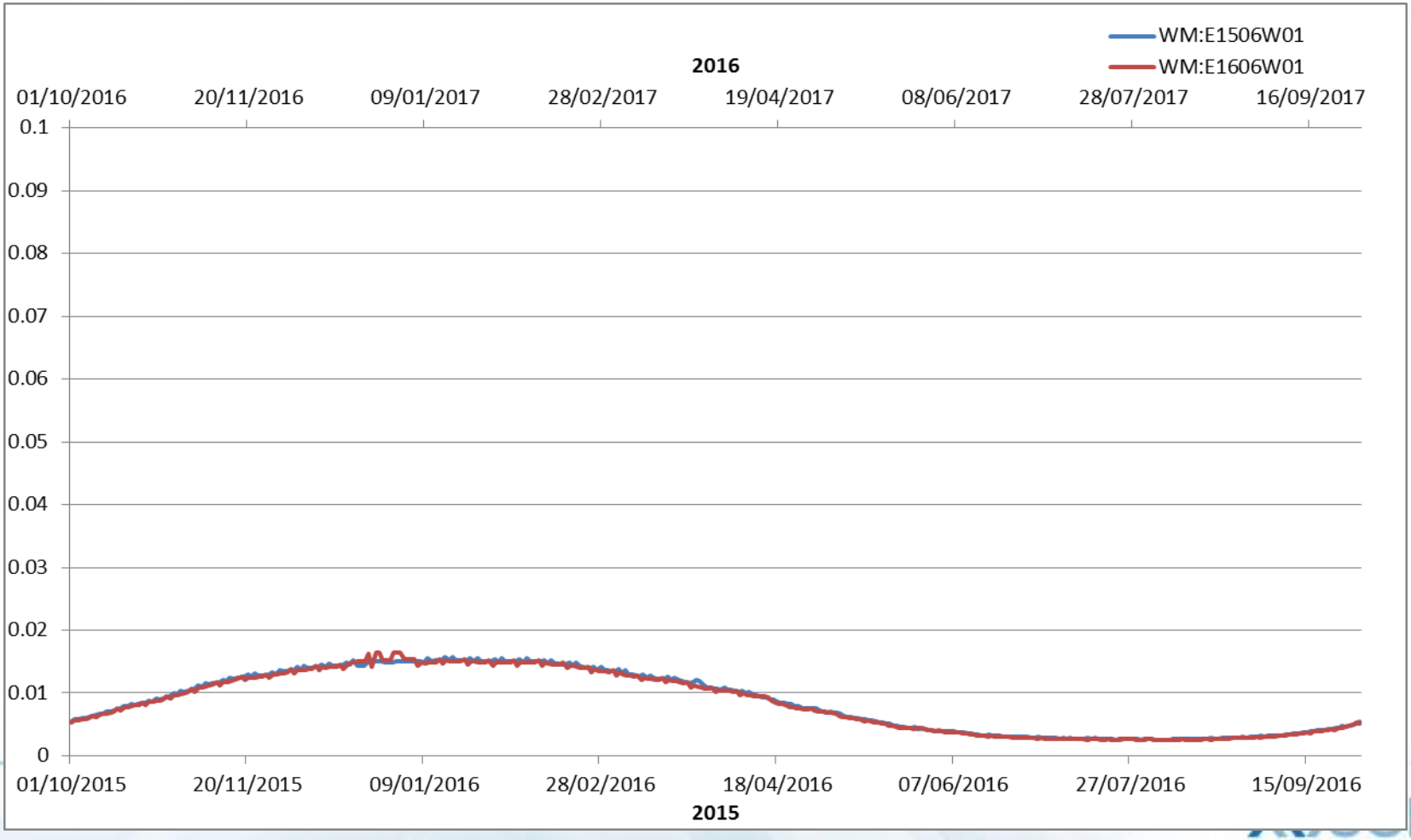
- The Christmas period highlighted on the chart covers the date range of 24th Dec 2016 to 3rd Jan 2017.
- The modelling has been done as per the spring approach 2016, which is in line with last year's approach.
- The DAF is then derived from the EUC and aggregate NDM demand model, which again has been calculated in the same way as last year.
- The scale on the chart is very small.
- Highlighted in the tables opposite are those days that had a different holiday code in comparison to last year
- The second table displays the Holiday Factors used in 2015 and 2016.
- The ratio of the 2016 vs 2015 Holiday Factors shows some notable movements in the Factors since last year
- Note that the scale on the previous slide is very exploded

Date	Day of Week	Holiday Code 2015	Holiday Code 2016	DAF 2016 vs DAF 2015
24/12/2016	Sat	2	3	0.002
25/12/2016	Sun	1	1	-0.001
26/12/2016	Mon	2	2	0.001
27/12/2016	Tue	2	2	0.001
28/12/2016	Wed	3	2	0.000
29/12/2016	Thu	3	3	0.000
30/12/2016	Fri	3	3	0.000
31/12/2016	Sat	2	3	0.002
01/01/2017	Sun	2	2	0.001
02/01/2017	Mon	2	2	0.001
03/01/2017	Tue	5	2	0.000

Holiday Code	Holiday Factor 2015	Holiday Factor 2016	Ratio 2016 vs 2015
1	0.124	0.112	90%
2	0.209	0.194	93%
3	0.253	0.244	96%
4	0.518	0.522	101%
5	0.541	0.586	108%

E.ON - Unusual DAF Christmas spikes for WM:E06W01 - Response

The chart below shows the same DAF but on a larger scale.



Recap on Queries and Responses

- Have the queries been adequately clarified?
- Any further comments/queries?
- Is TWG happy to recommend the models to DESC for review?

Approach to July DESC meeting

- Required Outcome – DESC approval of proposed Algorithms, agreement to proceed to wider industry review

- Suggested approach:
  - High level summary of process and outputs
  - Summary of TWG involvement and decisions
  - Summary of TWG reps and any agreed actions
  - TWG recommendation