Response to Representations on 2019/20 NDM Algorithms

DESC: 8th July 2019

Overview: Demand Estimation

- Key industry processes require various types of gas demand estimation at NDM Supply Points. These processes include:
  - Determining Supply Point Capacity
  - Daily Nominations and Allocations i.e. NDM Supply Meter Point Demand Formula
  - Determining Annual Quantities (AQs)
- To achieve this estimation, each NDM Supply Point belongs to an End User Category (EUC)
- EUCs are used to categorise NDM Supply Points in an LDZ and are defined by reference to variables which are maintained in the Supply Point Register
- Each EUC requires an associated Demand Model which represents its gas usage characteristics e.g. weather sensitivity, consumption profile etc
- Demand Models are mathematical models which provides an estimate of gas demand for each EUC by reference to variables determined by DESC

Overview: Demand Estimation

- For each Gas Year, DESC will develop or revise the definitions of the EUCs for the LDZ and the Demand Models for each EUC. The CDSP will then implement these decisions
- The annual process for determining the EUCs and Demand Models for the following gas year begins with the production of a document called the “Spring Approach”
- The Spring Approach provides an overview of the proposed EUC definitions and how the modelling shall be performed, including a reference to the sample data required in order to produce the relevant demand models
- DESC approved the latest version of the Spring Approach after its meeting in February, which included the possibility of deriving additional EUCs in Bands 1 and 2
- Section H of UNC and the NDM Demand Estimation Methodology document provides more detail of the Demand Estimation process

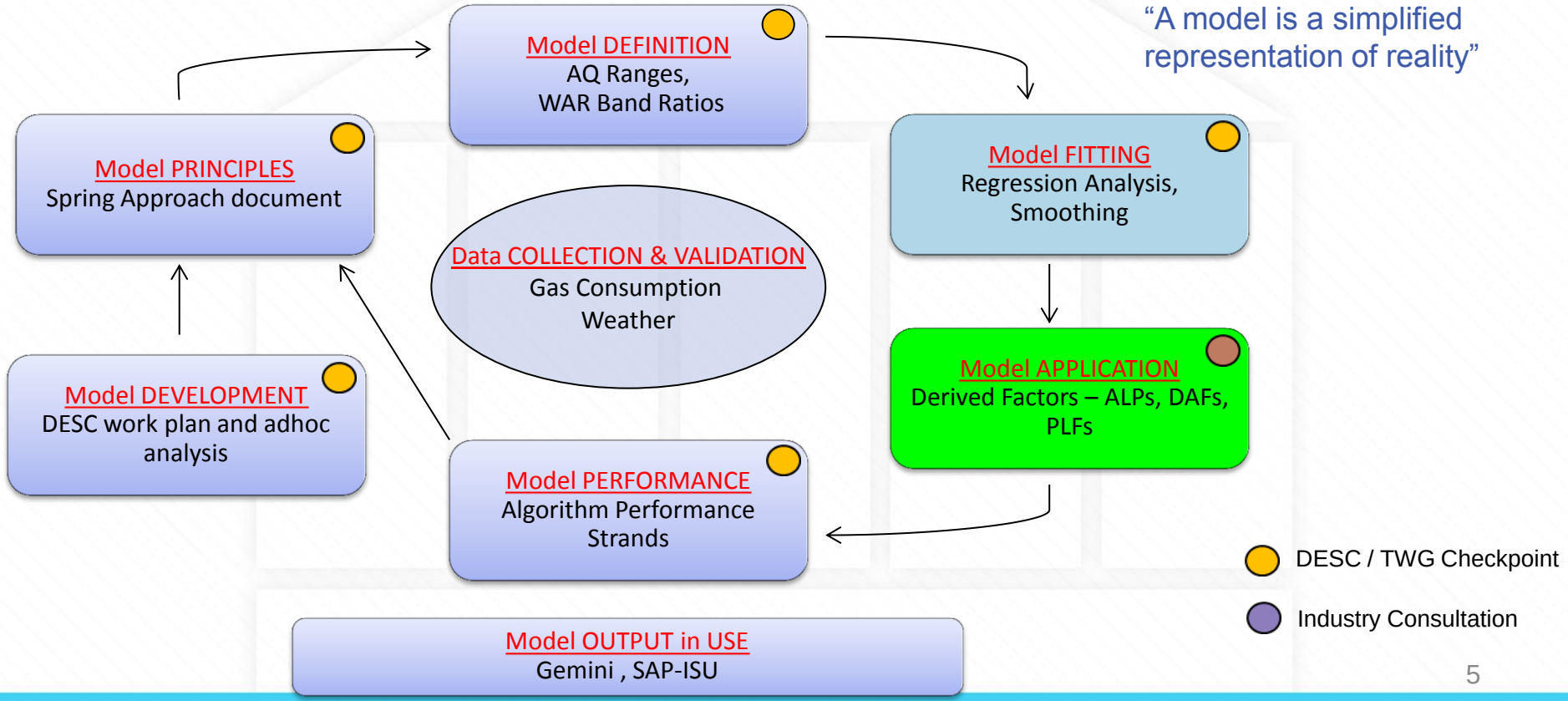
Overview: Demand Modelling Framework

- DESC's obligation of producing a set of End User Categories and Demand Models for the next gas year has to be delivered within certain timescales:
  - The sample data collected for analysis must include the most recent Winter period (December to March), meaning the sample data collation and validation cannot start until early April
  - The Final EUCs and Demand Models must be approved and submitted to the Authority and loaded to CDSP's systems by 15th August
  - In between April and August is when the sample data validation results are reviewed, WAR Band ratios are set, single year models are developed and reviewed, model smoothing is applied, draft Derived Factors are produced and reviewed, followed by an industry consultation commencing early June
- The above explains why it is necessary to agree modelling principles and methodologies in February each year, as there is not time in the Spring/Summer to make fundamental modelling decisions and gain agreement from all DESC members

Overview: EUC & Demand Model Lifecycle

The purpose of the EUC Demand Model is to represent the behaviour and reactions of the EUC Population

"A model is a simplified representation of reality"



Overview: Demand Estimation Timetable - 2019

High Level View of Demand Estimation Timetable 2019 - Key Checkpoints

PHASE	JAN'19	FEB'19	MAR'19	APR'19	MAY'19	JUN'19	JUL'19	AUG'19	SEP'19	OCT'19	NOV'19	DEC'19
1. MODEL PRINCIPLES												
Spring Approach 2019 Approved (DESC)		11th Feb										
2. Data COLLECTION & VALIDATION												
Sample data validated (CDSP)				15th Apr								
3. MODEL DEFINITION												
Agree Data Aggregations / WAR Band Limits (TWG)				24th Apr								
4. MODEL FITTING												
Small & Large NDM Single Year modelling review (TWG)					13th May							
5. MODEL APPLICATION												
Publication of Draft Derived Factors (CDSP)						3rd Jun						
Derived Factors Approved for wider industry (TWG/DESC)							8th Jul					
Final Approval of Derived Factors (DESC)							22nd Jul					
6. MODEL OUTPUT IN USE												
SAP-ISU and Gemini updated (CDSP)								15th Aug				
7. MODEL DEVELOPMENT												
Adhoc Work-plan approved (DESC)							22nd Jul			7th Oct		
8. MODEL PERFORMANCE												
Strands 1 to 4 reviewed (DESC)												9th Dec

Objective for today

- The final objective of the “Model Application” phase is for TWG, DESC and the industry to review the Derived Factors – ALPs, DAFs and PLFs in order to approve final versions to be used in Gemini and SAP-ISU for the new Gas Year

- Objective of today’s meeting is:

  – For TWG and DESC to consider and review all representations raised and CDSP’s responses

  – To gain TWG and DESC support for proposals prior to submitting for wider industry review

Summary of modelling progress so far

- Data Aggregations and WAR Band thresholds for latest single year models agreed at April TWG meeting (24th)
- Single year modelling approved at May TWG meeting (13th)
- Model smoothing process followed in second half of May along with production of draft Derived Factors (published for review 31st May)
  - Smoothed model outcomes summarised on slides 9 and 10
- 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

	2019	2018
Straight Models	90	69
Cut-Off Only	27	42
Summer Reductions Only	103	41
No Slope	0	0
Cut-Off and Reductions	14	4
Total Number of EUCs	234	156

- Small NDM represents approx. 88% of current NDM AQ
- 78 extra smoothed models in 2019 compared to last years final set of 156
  - 6 additional EUCs per LDZ

Large NDM: Smoothed Model Outcomes

	2019	2018
Straight Models	177	168
Cut-Off Only	16	39
Summer Reductions Only	52	44
No Slope	20	21
Cut-Off and Reductions	8	1
Total Number of EUCs	273	273

- Large NDM represents approx. 12% of current NDM AQ

TWG / DESC Review period

- Email sent on 31st May asked TWG representatives and DESC members for feedback by no later than close of play 21st June in order to prepare for today's meeting
- Feedback has been received from 3 parties
- Summary of Representations topics to be covered below:
  - Victory in Europe (VE) Bank Holiday announcement - Xoserve
  - Pre-Payment EUC models – Profiles and Peak Load Factors – Npower / WWU
  - General comments on ALP / DAF profiles – E.On

Topic 1: Victory in Europe (VE) Bank Holiday

- On 8th June, there was an announcement that the 2020 ‘May Day’ bank holiday Monday would be moved to a Friday to coincide with the 75th anniversary of VE day

- This has an impact on the draft profiles for 19/20 as the defined holiday periods include this early May period. This is described in the Spring Approach document (Appendix 3 – Holiday codes 9 and 10)

- Version 1 of the draft ALPs and DAFs reflected the following holiday code definition

	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	30/04/2020	01/05/2020	02/05/2020	03/05/2020	04/05/2020	05/05/2020	06/05/2020	07/05/2020	08/05/2020	09/05/2020	10/05/2020	11/05/2020	12/05/2020	13/05/2020	14/05/2020	15/05/2020	16/05/2020	17/05/2020
Current Rules	0	0	9	9	9	10	10	10	10	9	9	0	0	0	0	0	0	0

Response: Victory in Europe (VE) Bank Holiday

- Xoserve immediately wrote out to TWG and DESC and asked for their views on the following options

- Option 1 - Retain existing May bank holiday period start and end and swap Monday to Holiday code 10 and Friday to Holiday code 9

- Option 2 – Move May bank holiday period to start on Friday and end the following Sunday and assign B/H Friday code 9

	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	30/04/2020	01/05/2020	02/05/2020	03/05/2020	04/05/2020	05/05/2020	06/05/2020	07/05/2020	08/05/2020	09/05/2020	10/05/2020	11/05/2020	12/05/2020	13/05/2020	14/05/2020	15/05/2020	16/05/2020	17/05/2020
Option1	0	0	9	9	10	10	10	10	9	9	9	0	0	0	0	0	0	0
Option2	0	0	0	0	0	0	0	0	9	9	9	10	10	10	10	10	9	9

Response: Victory in Europe (VE) Bank Holiday

- 5 responses were received
  - Option 1 received 4 votes
  - Option 2 received 1 vote
- The modelling system was updated to reflect Option 1 and a revised set of ALPs and DAFs were calculated. Internal checks confirmed that the only significant changes were to the 2 days in question (4th and 8th May 2020)
- Version 2 of the ALPs and DAFs were published on 21st June and no new comments have been received. Are TWG / DESC happy with the revisions ?
- This announcement has perhaps been a useful reminder that TWG / DESC has not reviewed the current holiday codes and rules since 2011. This subject is currently on the adhoc work plan and so can be considered later this month when DESC reviews it

Topic 2: Pre-Payment EUC models

- This year new EUCs will be introduced for Bands 1 and 2, including ‘Pre-payment’ models. Comments have been received from Npower and WWU about the draft profiles for the “01BPD” EUC. These are summarised below:

- For 5 of 13 LDZs, the draft Peak Load Factors (PLFs) and Annual Load Profiles (ALPs) for the Prepayment domestic EUC are ‘peakier’ than the equivalent Non Prepayment domestic EUC

- Some of the holiday effects were also identified as being unusual when compared to the standard Non Prepayment domestic model

- The next few slides address these points in more detail

Topic 2: Pre-Payment EUC models - PLFs

- NPower comments:

- "1.If the new EUC band splits are supposed to represent different customer behaviours – why is there not consistency between the LDZs on the ratio of Load Factors for domestic prepayment: domestic non-pp"

- "2. Should the Load Factors for prepayment customer be lower than non-prepayment when that results in higher charges for a group which will include a higher number of vulnerable & fuel poor customers. And may be caused by insufficient sampling."

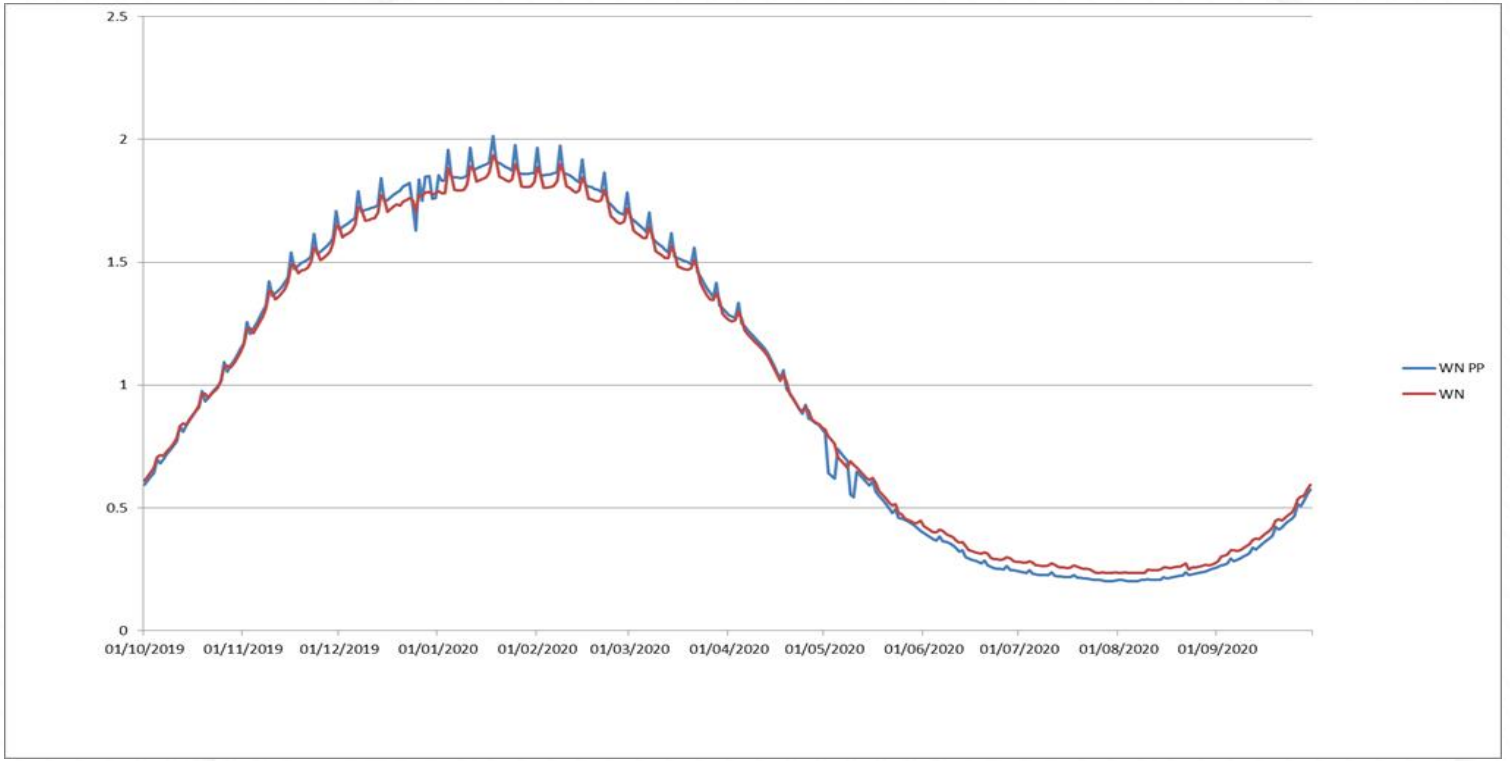
- WWU comments:

"Given that this is likely to affect some of the more vulnerable customers, an increase in charges as a result of higher SOQs is obviously a bit of a concern."

LDZ	Dom	PP	Ratio PP: Non PP
EA	0.315	0.341	1.08254
EM	0.32	0.308	0.9625
NE	0.335	0.342	1.020896
NO	0.345	0.335	0.971014
NT	0.297	0.314	1.057239
NW	0.315	0.312	0.990476
SC	0.34	0.359	1.055882
SE	0.285	0.299	1.049123
SO	0.284	0.28	0.985915
SW	0.293	0.293	1
WM	0.303	0.321	1.059406
WN	0.311	0.292	0.938907
WS	0.307	0.311	1.013029

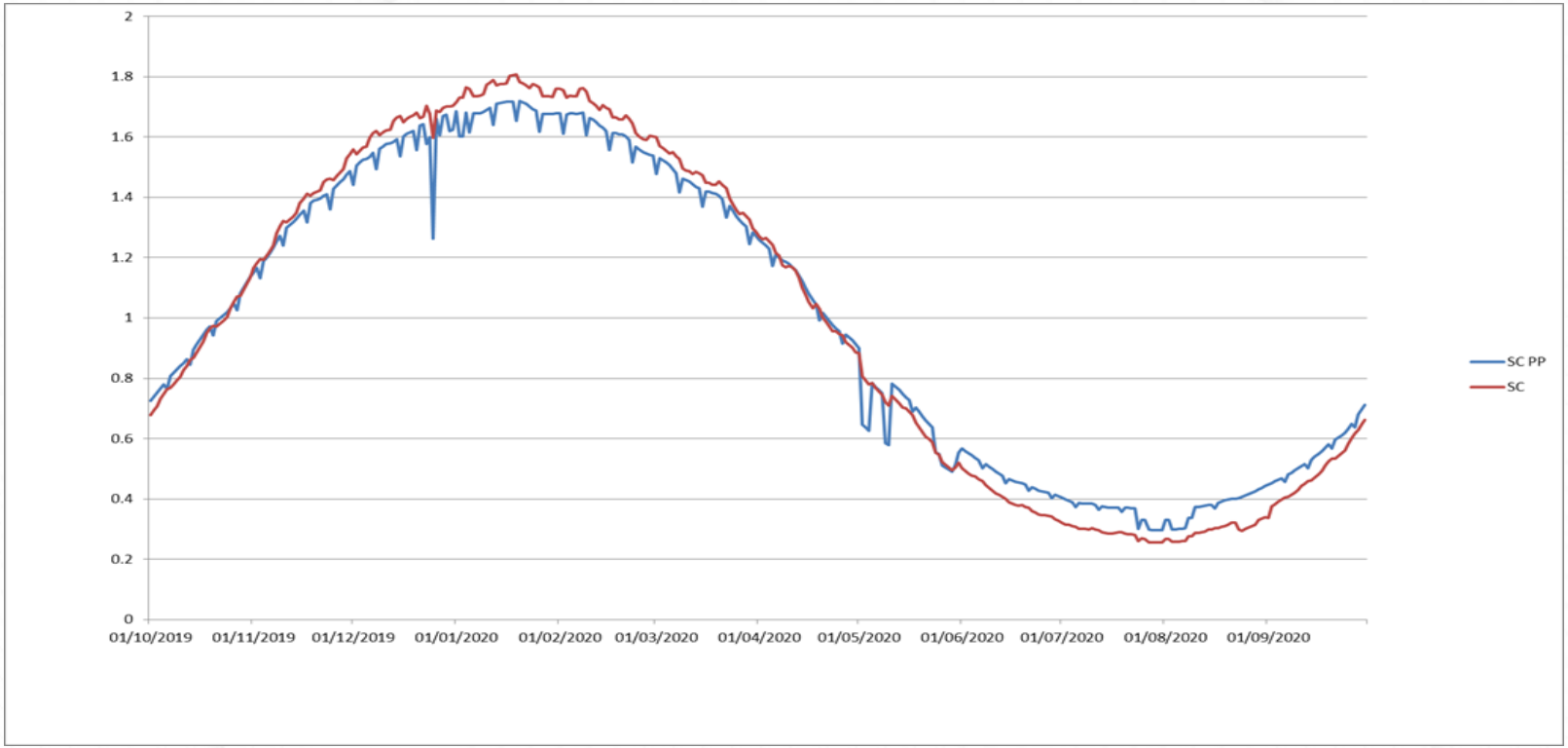
Topic 2: Pre-Payment EUC models - ALPs

- NPower comments: “Some LDZs show a peakier PP profile which is not as expected eg. WN”



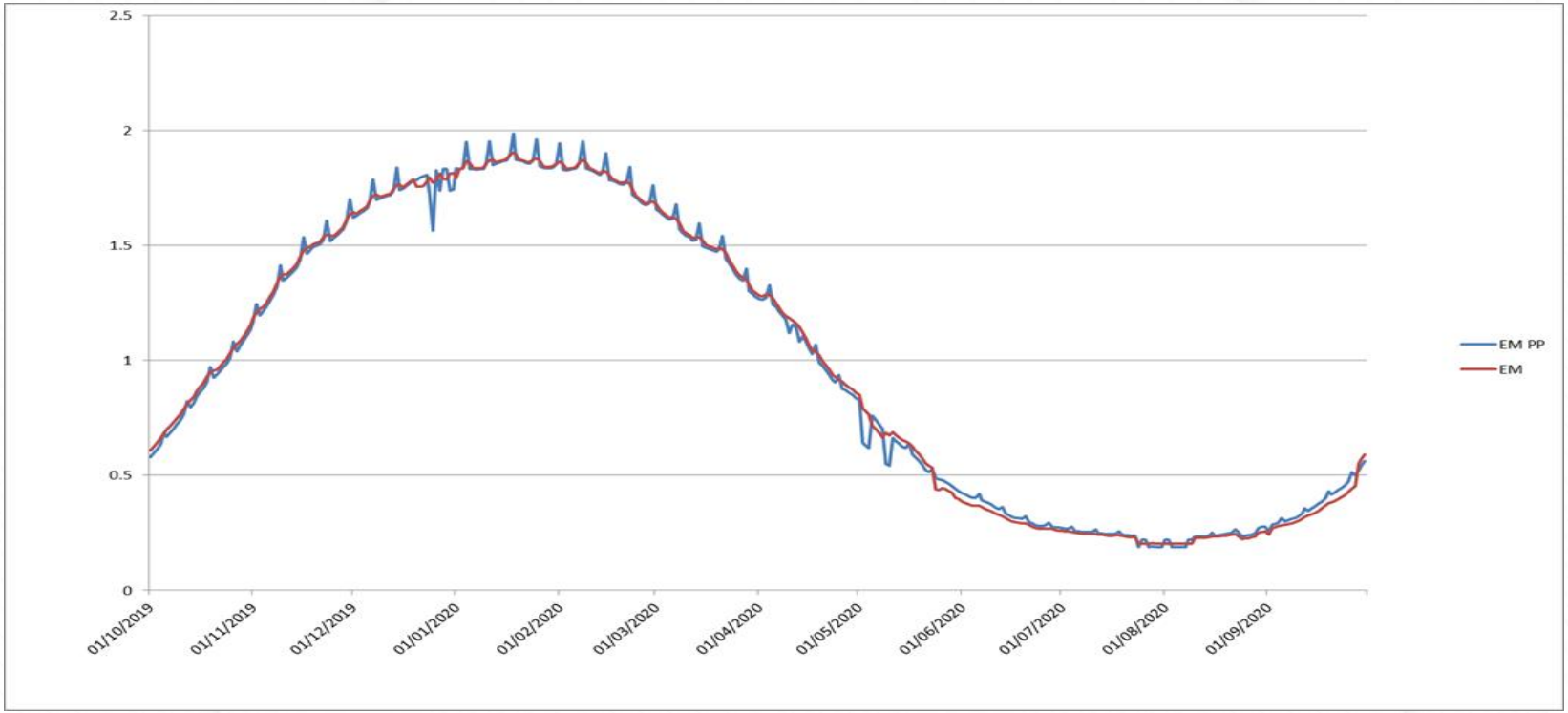
Topic 2: Pre-Payment EUC models - ALPs

- NPower comments: “More extreme Christmas effect for 01BPD. Varies by LDZ but most exhibit this eg. SC”



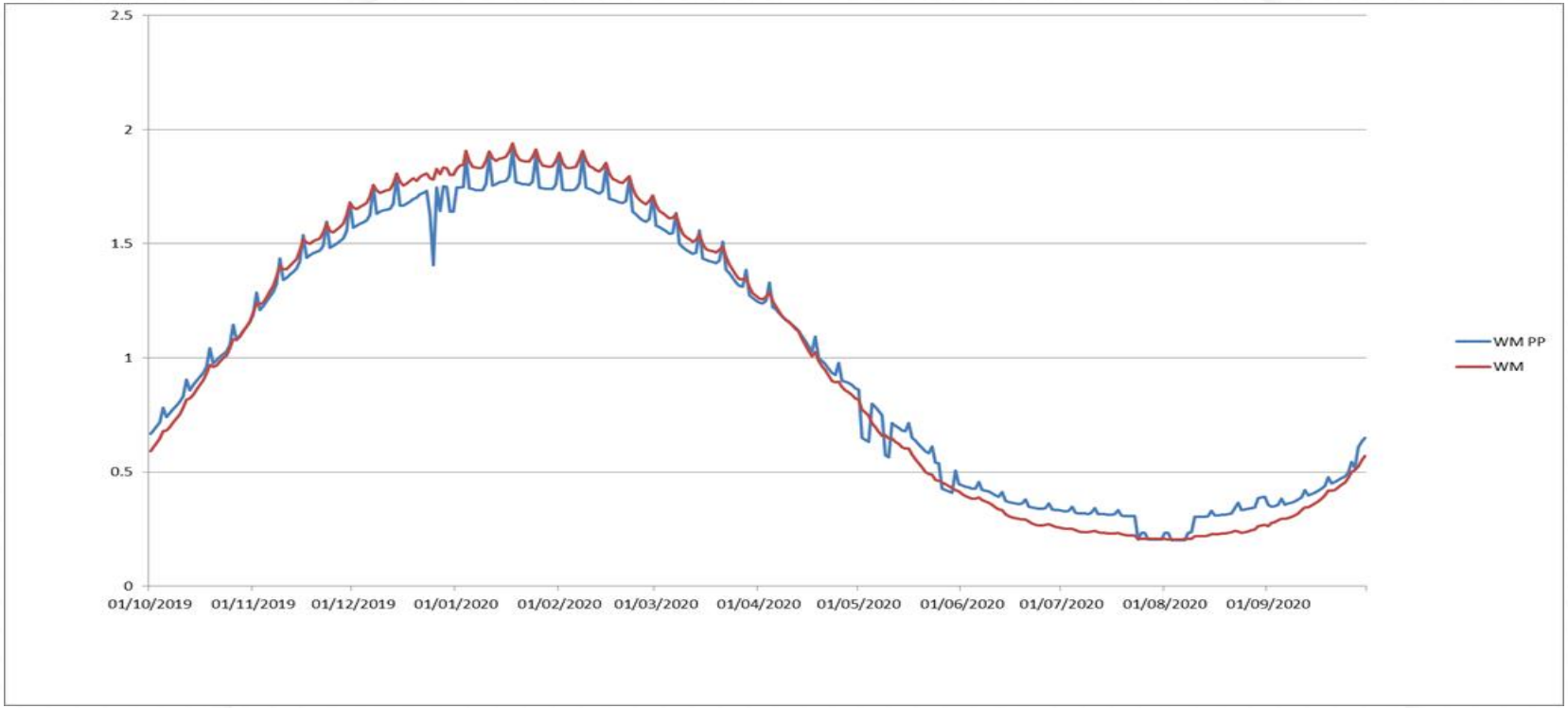
Topic 2: Pre-Payment EUC models - ALPs

- NPower comments: “Larger May bank holiday impact for PP. Aware this will be changing due to the bank hol change but thought worth highlighting eg. EM”



Topic 2: Pre-Payment EUC models - ALPs

- NPower comments: “Strange 2 week dip in the Summer in 01BPD like an industrial shutdown. Several LDZs show this eg. WM”



Response: Pre-Payment EUC models

- Reminder of the single year modelling results for Domestic Prepayment model
- Circa 80-90 supply points in each LDZ model

0 to 73.2 MWh pa Domestic PrePayment	Indicative Load Factor (ILF)	R^2 Multiple Correlation Coefficient (All days)	Sample Size (Supply Points)
SC	36%	95%	84
NO	35%	94%	75
NW	33%	94%	87
NE	36%	93%	84
EM	32%	94%	85
WM	34%	93%	88
WN	31%	93%	87
WS	33%	94%	92
EA	36%	93%	89
NT	33%	94%	86
SE	32%	95%	90
SO	29%	94%	85
SW	32%	92%	88

Response: Pre-Payment EUC models

- Holiday Codes for Prepayment Models vs Non-Prepayment Models – results taken from EUCHOL19S.txt

- Highlighted row relates to representation of large Christmas day reduction for SC model

- 12 of 13 LDZs show a bigger reduction for 01BPD on Christmas day (Holiday Code 1) when compared to the equivalent 01BND model

- Differences range from 1% to 17%

- The 01BPD EUC model holiday code will have been derived from 1 data point (25th Dec '18)

EUC	HOLCODE	HOLFACTOR	EUC	HOLFACTOR	Diff
SC:E1901BND	1	0.93	SC:E1901BPD	0.76	0.17
NO:E1901BND	1	0.942	NO:E1901BPD	0.853	0.09
NW:E1901BND	1	0.97	NW:E1901BPD	0.911	0.06
NE:E1901BND	1	0.939	NE:E1901BPD	0.902	0.04
EM:E1901BND	1	0.969	EM:E1901BPD	0.858	0.11
WM:E1901BND	1	0.967	WM:E1901BPD	0.806	0.16
WN:E1901BND	1	0.957	WN:E1901BPD	0.888	0.07
WS:E1901BND	1	0.918	WS:E1901BPD	0.815	0.10
EA:E1901BND	1	0.98	EA:E1901BPD	0.914	0.07
NT:E1901BND	1	0.911	NT:E1901BPD	0.964	-0.05
SE:E1901BND	1	0.955	SE:E1901BPD	0.944	0.01
SO:E1901BND	1	0.932	SO:E1901BPD	0.882	0.05
SW:E1901BND	1	0.958	SW:E1901BPD	0.85	0.11

Response: Pre-Payment EUC models

- Holiday Codes for Prepayment Models vs Non-Prepayment Models – results taken from EUCHOL19S.txt
- Model highlighted relates to holiday reduction queried in representation and is the reason for the observed ‘dip’
- WM model does reveal a large holiday reduction difference in 01BPD compared to 01BND
- Model 01BPD exhibits a summer reduction whereas model 01BND does not

EUC	CASECODE	HOLCODE	HOLFACTOR	EUC	CASECODE	HOLFACTOR	Diff
WM:E1901BND	HXNR	0	1	WM:E1901BPD	HXWR	1	0.00
WM:E1901BND	HXNR	1	0.967	WM:E1901BPD	HXWR	0.806	0.16
WM:E1901BND	HXNR	2	0.99	WM:E1901BPD	HXWR	1	-0.01
WM:E1901BND	HXNR	3	0.974	WM:E1901BPD	HXWR	0.939	0.04
WM:E1901BND	HXNR	4	0.988	WM:E1901BPD	HXWR	1	-0.01
WM:E1901BND	HXNR	5	0.998	WM:E1901BPD	HXWR	1	0.00
WM:E1901BND	HXNR	6	0.997	WM:E1901BPD	HXWR	1	0.00
WM:E1901BND	HXNR	7	1	WM:E1901BPD	HXWR	1	0.00
WM:E1901BND	HXNR	8	0.994	WM:E1901BPD	HXWR	1	-0.01
WM:E1901BND	HXNR	9	0.981	WM:E1901BPD	HXWR	0.776	0.21
WM:E1901BND	HXNR	10	0.958	WM:E1901BPD	HXWR	1	-0.04
WM:E1901BND	HXNR	11	0.998	WM:E1901BPD	HXWR	0.967	0.03
WM:E1901BND	HXNR	12	0.993	WM:E1901BPD	HXWR	0.771	0.22
WM:E1901BND	HXNR	13	0.943	WM:E1901BPD	HXWR	0.677	0.27
WM:E1901BND	HXNR	14	0.95	WM:E1901BPD	HXWR	0.585	0.37
WM:E1901BND	HXNR	15	1	WM:E1901BPD	HXWR	1	0.00
WM:E1901BND	HXNR	16	0.965	WM:E1901BPD	HXWR	0.906	0.06
WM:E1901BND	HXNR	17	1	WM:E1901BPD	HXWR	0.874	0.13
WM:E1901BND	HXNR	18	1	WM:E1901BPD	HXWR	0.884	0.12
WM:E1901BND	HXNR	19	1	WM:E1901BPD	HXWR	0.944	0.06
WM:E1901BND	HXNR	20	1	WM:E1901BPD	HXWR	0.874	0.13

Response: Pre-Payment EUC models

- The draft ALPs and PLFs for the Pre-Payment models are inconsistent with previous analysis and general industry views that Prepayment consumers follow a ‘flatter’ profile and are less weather sensitive

- These models have been derived from data provided by a single 3rd party supplier. Xoserve have checked the source data and are satisfied that the supply points which passed validation did not contain any data issues

- The third party which provided the SMART metered data also confirmed that the supply points used in the modelling represent Domestic Pre-payment consumers – the ‘Domestic’ element has been cross checked by Xoserve using the Market Sector Code

Response: Pre-Payment EUC models

- TWG decided in May not to use the Prepayment data collected last year as it was based on weekly reads and a number of the days were therefore filled in using the standard 01B WAALP

- For this years Prepayment models we only have one year to use which means the results are likely to be more volatile / inconsistent

- These results highlight the reason why traditionally a combined ‘smoothed’ model of 3 individual years is used to derive the profiles each year

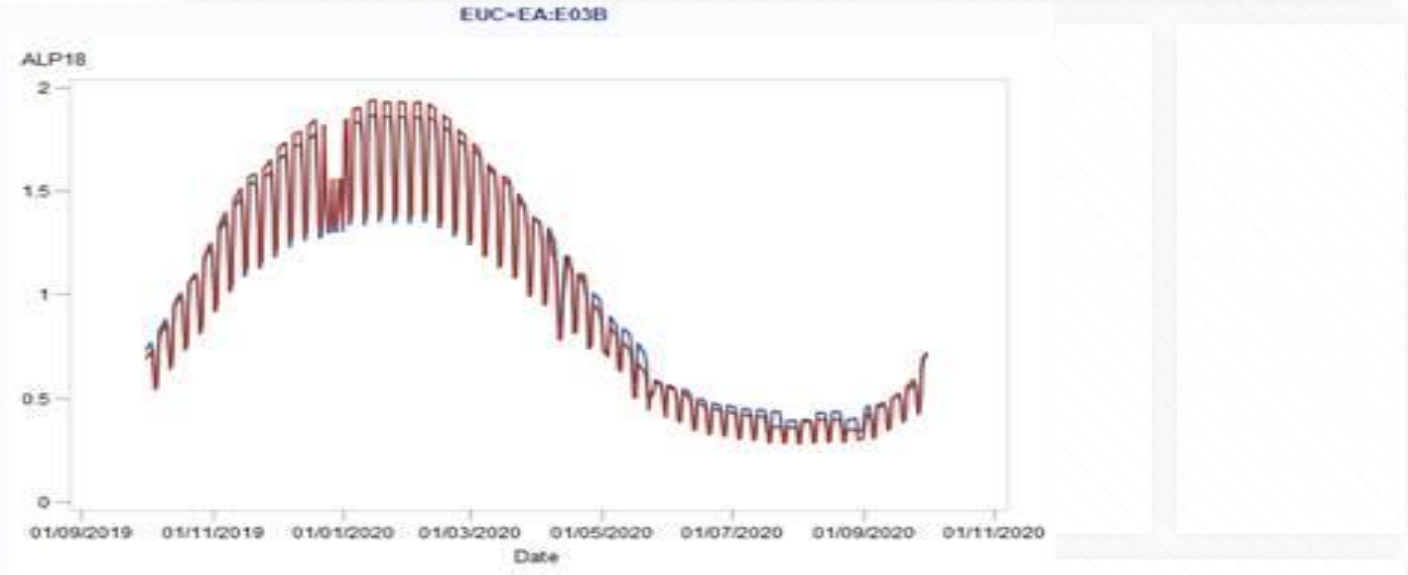
- In addition to this, Prepayment consumers by their nature are likely to be less predictable in their consumption patterns due to other factors outside of the current modelling approach ?

UPDATED (v2): Response: Pre-Payment EUC models

- A range of options for TWG / DESC to consider on Prepayment Domestic models are provided below:
- Do Nothing – 'Let the data decide' and use ALPs, DAFs and PLFs as published
- Where Prepayment Domestic PLFs are lower than standard Domestic values (i.e. peakier) **or for ALL Domestic PLFs** use the Non-Prepayment Domestic PLFs but retain ALPs and DAFs as published
- **Apply the Domestic PPM demand model used in the MOD451AV adjustments process**
- Produce a single National model based on all data collected
- For this year select the standard Non-Prepayment Domestic profiles until additional years data is available to produce a more robust model ? The system change for additional EUCs would still take place but in reality only the Domestic and Non-Domestic profiles would be different in Gas Year 2019/20
- DESC to provide views on the above options please

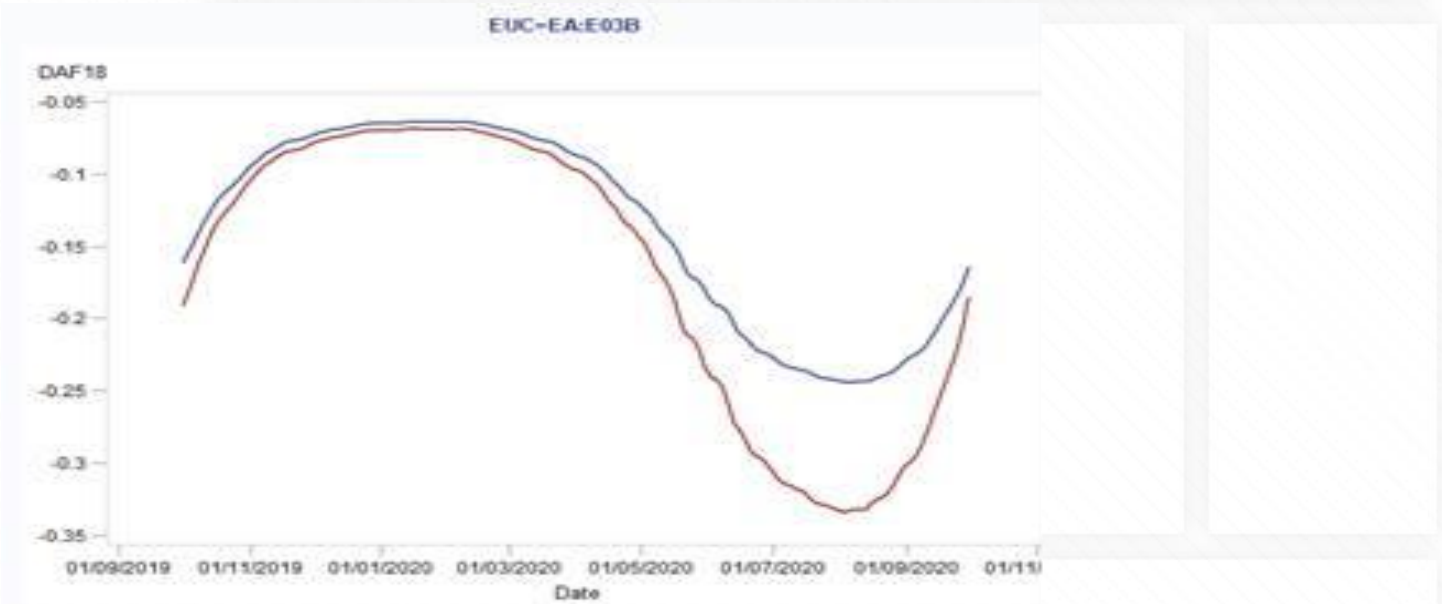
Topic 3: General comments on ALP / DAF profiles

- E.On's comments: "For a number of EUCs (mainly bands 3, 4, 7) we are seeing higher increases in winter weekdays and lower summers. Is this as expected? Is this mainly due to the extremes in weather from last year? Blue line is this year, red last year"



Topic 3: General comments on ALP / DAF profiles

- E.On's comments: "For bands 3 and 4 DAFs appear less sensitive in the summer, what is reason for this? Blue line is this year, red last year"



Response: General comments on ALP / DAF profiles

- The table below shows the CWV intercepts (a simple measure of weather sensitivity) for the last 2 years smoothed model for EA:03B. Note: Higher intercept = less weather sensitive

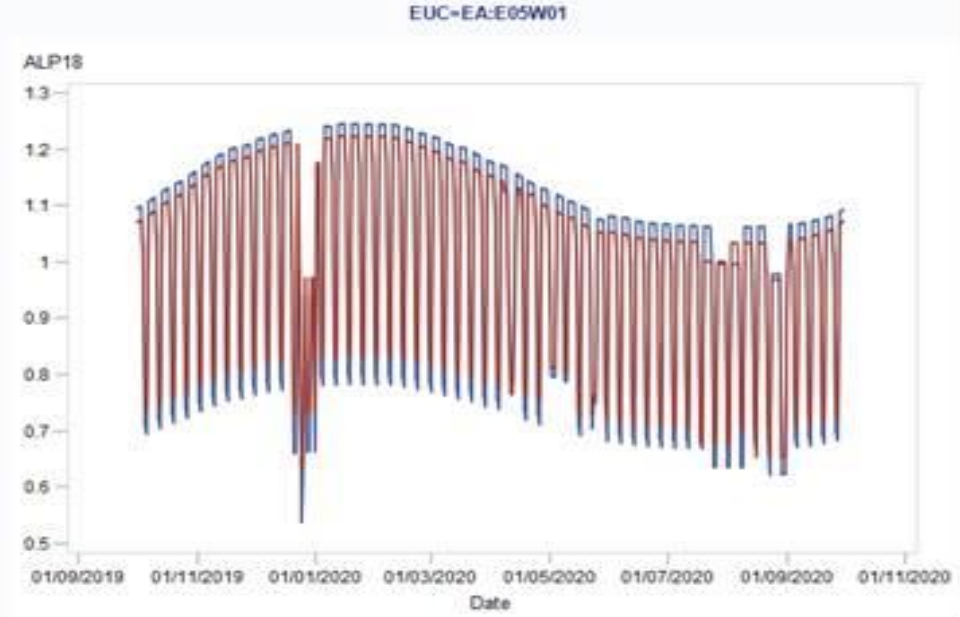
Analysis Year	2015/16	2016/17	2017/18	2018/19	Smoothed
2018	19	18.8	20.6	-	19.5
2019	-	18.8	21.5	21.6	20.5

- You can see that the latest year is less weather sensitive and this has replaced the oldest year which was more weather sensitive. This change has contributed to the smoothed model becoming ‘flatter’. The same analysis is also likely to explain other model instances

- Difference in the summer weather sensitivities observed in the DAF is as a result of the 2019 model containing a summer reduction whereas the 2018 model did not

Topic 3: General comments on ALP / DAF profiles

- E.On's comments: "For a number of EUCs (mainly bands 5, 6) we are seeing flatter (less peaky) profiles. What is reason for this ? Blue line is this year, red last year"



Response: General comments on ALP / DAF profiles

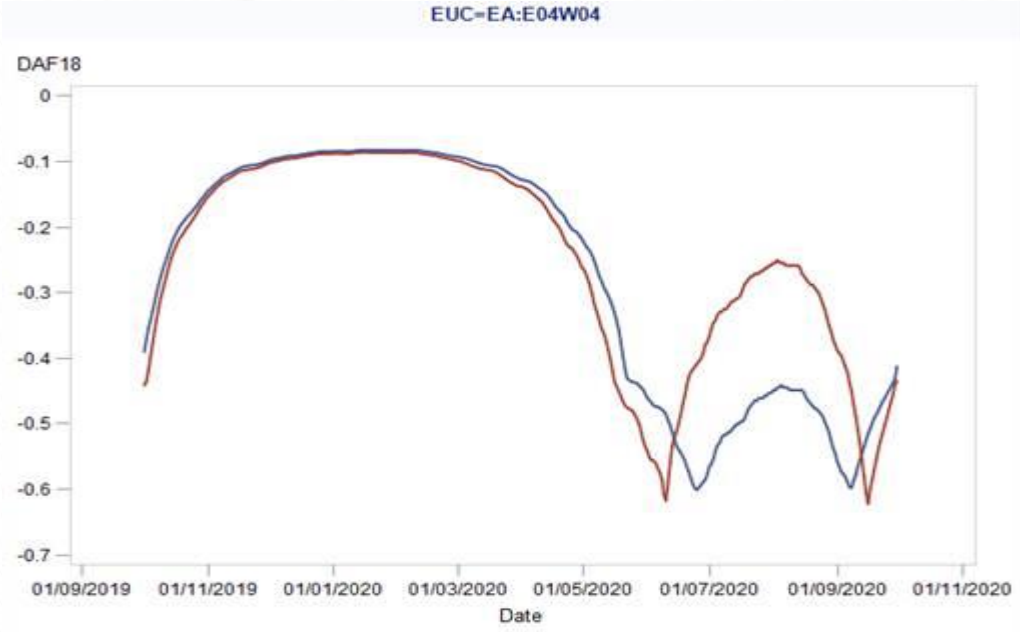
- The table below shows the CWV intercepts (a simple measure of weather sensitivity) for the last 2 years smoothed model for EA:05W01. Note: Higher intercept = less weather sensitive

Analysis Year	2015/16	2016/17	2017/18	2018/19	Smoothed
2018	67.9	99	78.5	-	80.1
2019	-	99	78.5	77.4	84

- You can see that the latest year is less weather sensitive and this has replaced the oldest year which was more weather sensitive. This change has contributed to the smoothed model becoming ‘flatter’. The same analysis is also likely to explain other instances

Topic 3: General comments on ALP / DAF profiles

- E.On's comments: "Could you explain some sensitivities that look like the below? Why do they get more sensitive either side of summer? Blue line is this year, red last year"



Response: General comments on ALP / DAF profiles

- For this model (EA:04W04) in 2018 and 2019, it has exhibited a cut-off which is characterised by the similar shape
- The point at which the inverted curve towards the right hand side of the chart starts is reflective of the cut off value
- In 2019 the model cut-off is 16.1 and the 2018 model cut-off was 15.6
- The effect is that when the model parameters are being expressed with the Seasonal Normal CWV, the 2019 pattern can go further, from 15.6 to 16.1 (an additional 0.5 degrees) prior to the cut off influence taking over
- The DAF formula is $WSENs_t$ / SND_t. The cut off only applies in the SND_t calculation so as the SNCWV goes warmer (earlier part of summer) it is applied and then after summer as the SNCWV returns back below 16.1 (in 2019) the full SND value is calculated

Conclusions

- DESC have approved the use of Option 1 in the modelling of early May bank holiday period. Version 2 of ALPs and DAFs incorporating this approach are available on the secure area – no additional comments received since publication

- Representations on Domestic Prepayment models highlight some inconsistencies with the Peak Load Factors and unusual holiday effects within some of the profiles

  These models are based on a single years data and from only one supplier which are probably contributing to these results

- Other representations raised are explained by the difference in smoothed model weather sensitivities. This can occur when latest single year is markedly different to the oldest single year which has dropped off from previous years smoothed model

Next Steps

- Are DESC happy to approve the smoothed EUC demand models which have produced this year's draft Derived Factors (ALPs, DAFs and PLFs), as currently published ?

- If not, need to confirm actions required to progress, ahead of wider industry consultation (5 day window)

- Once DESC approval is gained on this year's process, Xoserve can apply the uplift factors to the DAFs (only) as agreed earlier this year when changes were made to the NDM Demand Estimation Methodology document.

- This will mean, similar to last year, there will be a set of ALPs and DAFs for use in SAP-ISU for AQ calculations and a set of ALPs and DAFs for use in Gemini for NDM Nominations and Allocations

- DESC meeting on 22nd July will provide final opportunity to consider and approve this years proposals. Simulation analysis of impacts to UIG for Gas Year 2018/19 using uplifted DAFs to be provided ahead of meeting