



Demand Estimation Sub Committee

3.0 Adhoc Workplan Update – (b) EUC Review

1st March 2023

Overview



- An overview of the Demand Estimation process and output can be found [here](#)
- Annual modelling cycle of activities are represented in diagram opposite
- This presentation relates to the “Model Review” phase of the Demand Model cycle

CDSP / DESC Obligations and Timetable: October 2022 to September 2023

Milestone	UNC H Ref	10/22	11/22	12/22	01/23	02/23	03/23	04/23	05/23	06/23	07/23	08/23	09/23
DESC Membership confirmed	1.12	✓											
NDM Sampling: Data Collection and Validation	1.6	✓						✓					
NDM Algorithm Performance for Gas Year 2021/22	1.8			✓								✓	
DESC Adhoc Workplan	1.7	✓		✓			✓						
DESC Modelling Approach – EUCs and Demand Models	1.7			✓			✓						
Single Year EUC Demand Modelling	1.7								✓				
Model Smoothing and Draft Gas Demand Profiles	1.7									✓			
Industry Consultation	1.8									✓	✓		
Gas Demand Profiles finalised and Core systems updated	1.9											✓	
Climate Change Methodology progressed (SN Review 2025)	1.4			✓			✓		✓		✓		

Background

Autumn/Winter 22/23 – Ad Hoc Work Plan Item 2 – Proposal

- Review of existing End User Category (EUC) definitions
 - DESC implemented the first set of changes to the EUC definitions 3 years ago (from Gas Year 2019/20), this introduced new categories that uses the Market Sector Code (MSC), Meter Mechanism and Payment Type
 - Domestic Band 1 (0 to 73.2 MWh pa) i.e. “01BND” represents a large proportion of the NDM market. Our proposal is to review the sub bands within this AQ range to check if the profile remains homogenous or are there more distinct profiles existing ? e.g. is there a cooking only band which we are applying a weather sensitive profile too
 - Large NDM (>2,196 MWh pa): Do we need 273 Large NDM EUC models for 12% of the NDM population, when we have 234 for 88% of the NDM population?

Our proposal is to investigate whether a better approach to managing these Large EUCs exists

- Any recommendations from this review would need to prove they are better than existing arrangements e.g. reduced modelling error and improved NDM algorithm performance
- Expect to report at October, December and March DESC meetings.

Where possible any proposed changes / recommendations in place for Spring 2023

Objectives

- Band 1 Domestic Cooking only loads (e.g. less weather sensitive)

- Bands 3 and 4 WAR Band Calculations

VOTE
REQUIRED

Reduce models for Large NDM

- Bands 5-8 WAR Band Calculations

VOTE
REQUIRED

- Band 9

VOTE
REQUIRED

Introduction

- The results presented in this slide pack are the outcome from the analysis proposed in the October DESC as part of the EUC Review Adhoc workplan item
- Please find below a link to the slides presented at the October DESC
- These cover the proposed areas of investigation and the analysis undertaken
- [October slide pack](#)

Approach

In order to apply the proposed changes to all input years for a smoothed model, the following approach was taken:

- Re-ran the last 3 years in-use single year models with revised inputs and parameters
- Reproduced the modelling for 2022, creating ALPs for 2021/22 on a RETRO basis
 - The 'Retro' analysis is based on the algorithms derived for the current Gas Year (i.e. 2022/23) but retro fitted with appropriate adjustment for the pattern of days of the week and holidays for Gas Year 2021/22
 - This avoided going back to 2017/18 for I&C and 2018/19 for Domestic
 - This unfortunately resulted in a 6 month overlap in input to output data

Then, to test the modelling performance of the rules

- Re-ran the Algorithm Performance for Gas Year 2021/22 using the recalculated ALPs
- Results were then compared with the live results on the same RETRO basis (i.e. from the modelling for Gas Year 2022/23, but retro-fitted to the 21/22 calendar)

Analysis

- Band 1 Domestic
- Bands 3 and 4 WAR Band Calculations
- Bands 5-8 WAR Band Calculations
- Band 9 Consumption Band Calculation

Band 1 Domestic

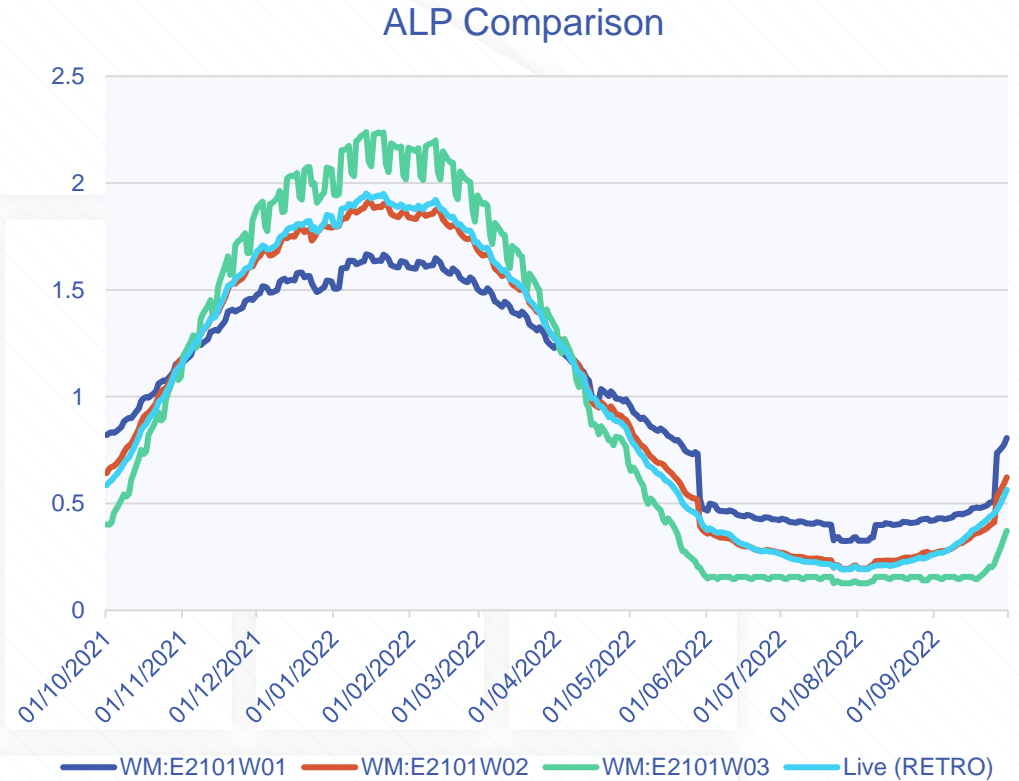
- Analysis looked into separating the Domestic users into theoretical subgroups e.g.
 - Cooking only (little seasonality)
 - Cooking and Heating / Hot Water
 - Heating / Hot Water (very seasonal)
- The approach to target the subgroups was to use Winter Annual Ratios (WAR), as the functionality exists within the modelling system
- As only 3 bands were required, to maximise the sample data the percentage splits for the 3 bands were set at 30/40/30
 - 4 bands using the existing approach of 20/30/30/20 splits did not provide favourable results
 - Also tested was setting the WAR boundaries at LDZ level but this did not improve the results

01BND WAR Band Observations

- We have used Winter Annual Ratios (and WAR Bands) as a mechanism for identifying the different seasonal profiles that may exist within Band 1 Domestic
- In this presentation the “BND” portion of the EUC has been replaced with W01, W02 and W03
- W01 Meters are the least weather sensitive and W03 is the most weather sensitive. W01 meters are therefore more likely to be cooking only, whilst W03 meters are more likely to be heating only
- The average (over the 3 years) Winter Annual Ratios calculated were: 0.517 / 0.578 /1.000
- Class 4 Domestic meters do not have a requirement for monthly reads, unlike Class 3 Domestic and the higher EUC Bands, therefore the Winter Annual Ratio (WAR) cannot be calculated for all meters within UK Link
 - We have been able to calculate the WAR for all the meters in the sample data as we have daily reads

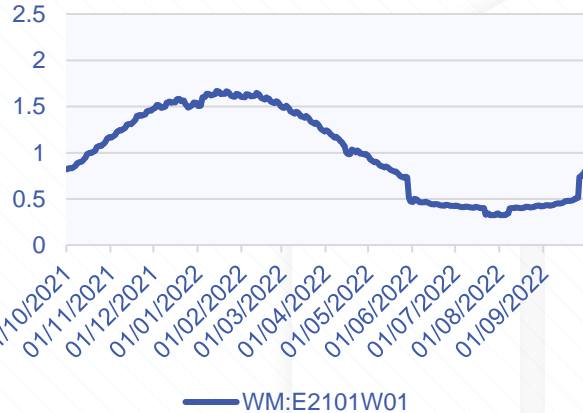
Band 1 Domestic – ALP Comparison

- The chart on the right shows the ALPs as calculated for the 3 WAR Bands and the Retro ALP for 01BND in WM
- The middle WAR Band (c.40% of meters) is fairly close to the current ALP
- As expected the lowest and highest WAR Bands ALPs differ quite a bit from the current ALP

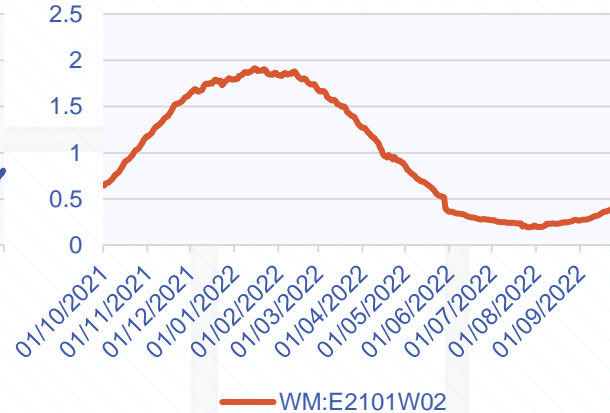


Band 1 Domestic – ALP Comparison

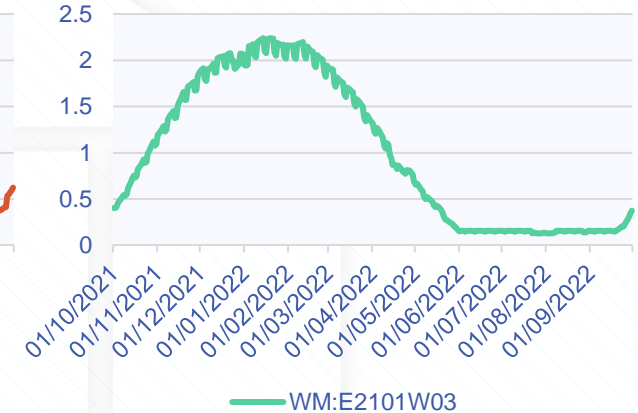
WAR Band 1 - Low Seasonality



WAR Band 2 Mixed



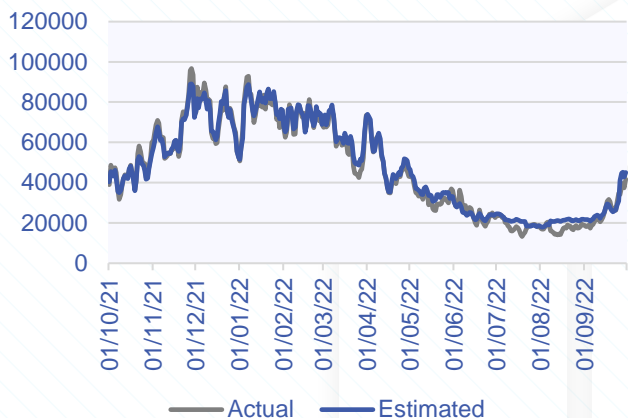
WAR Band 3 High Seasonality



- Band 1 is much flatter and more indicative of a cooking only load
- Band 3 is much more seasonal with the summer flat to cover hot water usage only

Band 1 Domestic – Actual vs Estimated

WAR Band 1



WAR Band 2

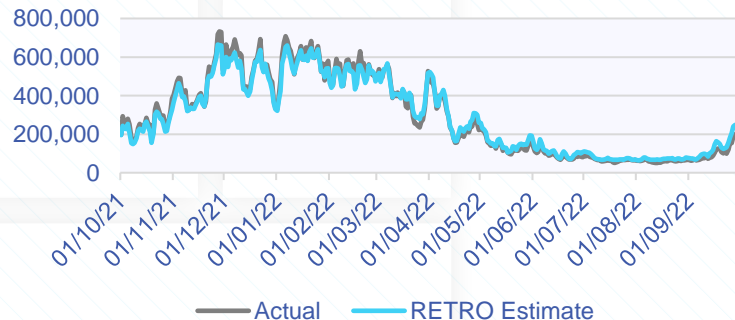


WAR Band 3



- Charts above show the Actual vs Estimated volume for the 3 WAR Bands in 01BND (all LDZs)
- The chart on the right shows the RETRO Actual vs Estimated
- All 3 Bands show a fairly good fit, in line with the current forecasting method
- Band 1 shows more variance in the summer months

Actual vs Estimated (01BND)



Band 1 Domestic - Results by LDZ and Month – W01

01W01	EA	EM	NE	NO	NT	NW	SC	SE	SO	SW	WM	WN	WS	Overall
October	-1%	-2%	-4%	-5%	-6%	-6%	-8%	-3%	-11%	-4%	-8%	-10%	-9%	-6%
November	-3%	-5%	-3%	-5%	0%	-2%	-5%	3%	2%	-3%	-5%	-2%	-3%	-3%
December	-6%	-4%	-5%	-4%	-4%	-4%	-4%	-2%	0%	-5%	-3%	-6%	-3%	-5%
January	-3%	-3%	-2%	-5%	-3%	1%	-4%	0%	1%	-4%	-3%	-1%	-7%	-3%
February	-3%	-1%	-4%	-2%	-4%	-7%	-3%	5%	-3%	-1%	-1%	-3%	0%	-3%
March	4%	1%	2%	3%	1%	1%	2%	4%	2%	2%	2%	0%	2%	2%
April	-5%	-4%	-5%	0%	-5%	-5%	-3%	3%	-2%	-4%	-3%	-4%	-5%	-4%
May	-12%	-1%	0%	0%	-10%	-10%	-4%	2%	7%	-13%	2%	-8%	-6%	-4%
June	-6%	3%	-16%	-17%	-12%	-15%	-21%	-1%	-5%	-10%	-4%	-5%	-9%	-13%
July	-8%	-4%	-1%	-2%	1%	-17%	-10%	5%	14%	-6%	5%	-4%	-5%	-2%
August	-5%	-7%	3%	-1%	10%	-10%	-10%	9%	16%	1%	18%	12%	2%	3%
September	-18%	-9%	-29%	-17%	-13%	-28%	-19%	-16%	-9%	-16%	-21%	-34%	-18%	-19%

- The table compares the results for W01 with 01BND RETRO
- Values are the variance between the absolute Mean Percentage Error for the Live RETRO ALP and the 01W01 RETRO ALP
- Negative values have a lower absolute MPE and indicate an improvement to the Modelling Result
- Results are better for almost all areas and months

Band 1 Domestic - Results by LDZ and Month – W02

01W02	EA	EM	NE	NO	NT	NW	SC	SE	SO	SW	WM	WN	WS	Overall
October	-1%	1%	4%	3%	0%	6%	2%	-2%	-2%	2%	-1%	1%	-2%	1%
November	0%	-1%	-1%	0%	1%	-1%	0%	-1%	-1%	-1%	0%	-2%	-1%	0%
December	-2%	-3%	-3%	-2%	-3%	-4%	-3%	-1%	-2%	-3%	-1%	-4%	-2%	-2%
January	-2%	-3%	-4%	-2%	-2%	-2%	-2%	0%	-2%	-3%	-2%	-1%	-2%	-2%
February	-2%	-4%	-3%	-3%	-2%	-3%	-2%	-1%	-1%	-2%	-3%	-4%	-2%	-2%
March	1%	3%	0%	0%	3%	2%	0%	1%	1%	1%	1%	3%	2%	1%
April	0%	-4%	-4%	-2%	-1%	-5%	-2%	-2%	0%	-5%	-3%	-5%	0%	-2%
May	-4%	-4%	-9%	-6%	4%	-9%	-5%	6%	3%	-2%	2%	-11%	-5%	-3%
June	-11%	-6%	-11%	-8%	-12%	-9%	-5%	-4%	-11%	-9%	-9%	-8%	-14%	-10%
July	-9%	-3%	-9%	-16%	-3%	-5%	-7%	2%	-2%	-3%	4%	-9%	-7%	-5%
August	-4%	5%	-8%	-18%	-2%	-1%	-7%	5%	4%	3%	16%	-1%	-1%	-1%
September	-13%	-20%	-7%	-9%	-13%	-14%	-6%	-8%	-10%	-11%	-12%	-20%	-9%	-12%

- The table compares the results for W02 with 01BND RETRO
- Negative values (highlighted green) have a lower absolute MPE and indicate an improvement to the Modelling Result
- Results are better for almost all areas and months

Band 1 Domestic - Results by LDZ and Month – W03

01W03	EA	EM	NE	NO	NT	NW	SC	SE	SO	SW	WM	WN	WS	Overall
October	8%	8%	7%	11%	7%	9%	11%	6%	5%	7%	8%	9%	18%	8%
November	-3%	-1%	-2%	0%	-5%	-1%	0%	-1%	-1%	-1%	-2%	-2%	0%	-2%
December	-1%	-2%	-2%	-1%	0%	-1%	0%	0%	2%	0%	0%	-2%	-1%	-1%
January	-3%	-2%	-2%	-1%	-2%	-2%	0%	-1%	2%	-1%	0%	-3%	-1%	-1%
February	-1%	0%	-2%	0%	0%	-1%	-2%	2%	3%	-1%	2%	-2%	0%	0%
March	1%	0%	3%	0%	0%	1%	3%	-1%	0%	2%	0%	2%	0%	1%
April	1%	3%	4%	0%	2%	3%	2%	2%	5%	7%	4%	4%	-2%	3%
May	-19%	4%	6%	20%	-4%	0%	-3%	10%	-1%	-5%	16%	-16%	-12%	-4%
June	-2%	5%	-1%	-3%	-8%	-20%	-13%	1%	-7%	-11%	-6%	3%	-9%	-8%
July	-1%	9%	-12%	0%	8%	17%	12%	15%	17%	20%	13%	-6%	19%	2%
August	-4%	18%	-8%	6%	15%	33%	19%	21%	25%	25%	17%	-2%	32%	7%
September	-16%	-18%	-26%	-19%	-18%	-12%	-16%	-10%	3%	-7%	-10%	-23%	-12%	-14%

- The table compares the results for W02 with 01BND RETRO
- Negative values (highlighted green) have a lower absolute MPE and indicate an improvement to the Modelling Result
- Results are less good for W03 than W01 and W02 particularly for the summer, however this was when there were significant changes to consumer behaviour as a results of weather and price rises

Band 1 Domestic - Blending WAR ALPs

- Blending the 3 WAR ALPs into 1 using the same weighting as in the forecasting (30/40/30) produces an ALP that can be used by all 01BND meters (by LDZ)
- The chart shows the estimated volumes using the Blended ALP and the RETRO ALP and the actual Volume for 01BND
- For the first 6 months there is little difference in the two estimated daily volumes, with the main variances from May onwards
 - This was during the period of reduced usage due to weather and rising prices
- There is no benefit to using a Blended ALP – overall modelling result deteriorated by 0.3%



Band 1 Domestic - Conclusions

- Recent years have not had 'normal' consumption patterns due to COVID-19, price rises and unusual weather, making analysis difficult
- Analysis suggests that there are different profiles existing within the current "01BND" EUC
- The separately calculated ALPs and DAFs produced more favourable Algorithm Performance than produced with the overall ALPs and DAFs, however it is not possible to implement them currently
- Combining the segmented data into a useable format (i.e. blending the 3 separately modelled ALPs and DAFs into one) doesn't provide any benefit over the current methodology
- As more Domestic meters become Class 3 and more data is available then it would be a benefit to revisit this analysis
- Currently system limitations make any changes hard to implement due to the requirement to lengthen the EUC beyond the current 11 characters and the availability of relevant data on 'Supply Point Register' (i.e. UK Link) to use in assignment of EUCs

Bands 3 and 4 WAR Band Calculations

- Analysis looked at separating the modelling for EUC Bands 3 and 4 WAR Band modelling
- Until now the Bands have been combined, however sufficient sample data is received in order to model separately – see table on right

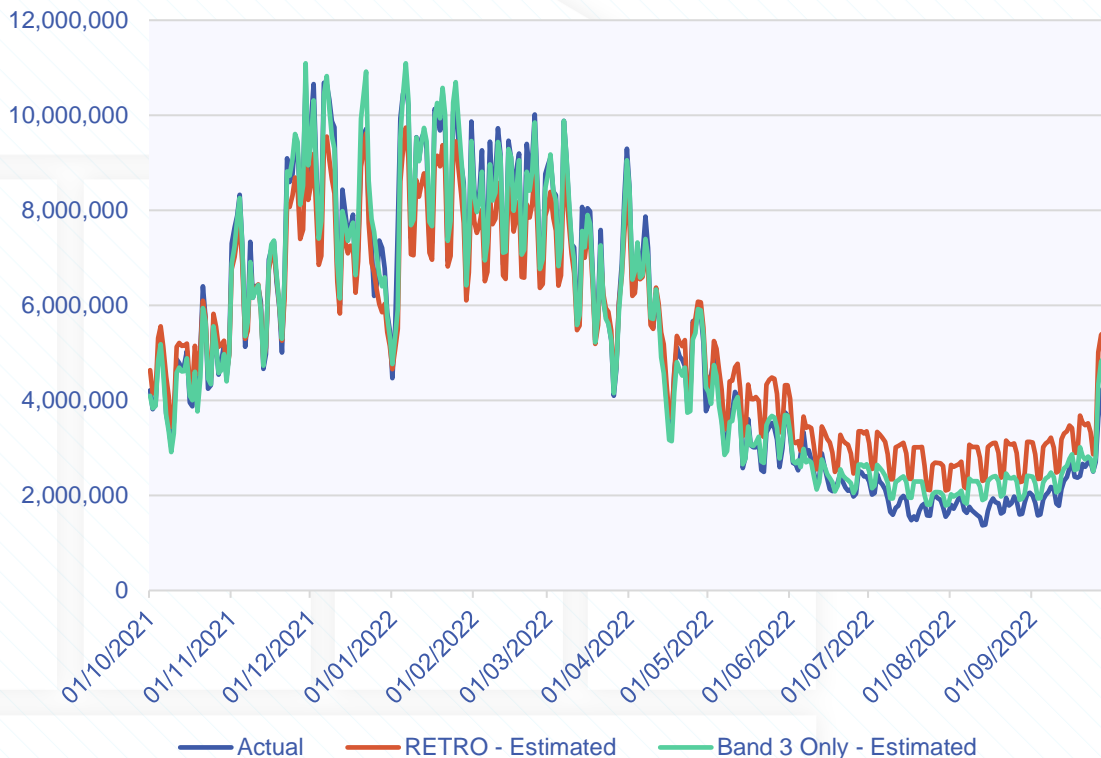
Sample Count - 21/22 Analysis Period			
LDZ	Band 3	Band 4	Combined
SC	354	318	672
NO	205	178	383
NW	335	264	599
NE	198	257	455
EM	297	210	507
WM	268	253	521
WN	44	38	82
WS	96	99	195
EA	294	232	526
NT	336	274	610
SE	349	310	659
SO	271	267	538
SW	233	176	409
Total	3280	2876	6156

Bands 3 and 4 WAR Band Calculations

- The chart on the right shows the Estimated Volume for Band 3 W01-04 forecast using just Band 3 and using Bands 3 and 4 Combined
- Forecasting Band 3 W01-04 separately to Band 4 W01-04 produces a more accurate forecast for Band 3 W01-04 Meters

Model	Modelling Error (MPE)
RETRO	2.4%
Band 3 Only	1.1%

Band 3 W01-04 Actual Vs Estimated

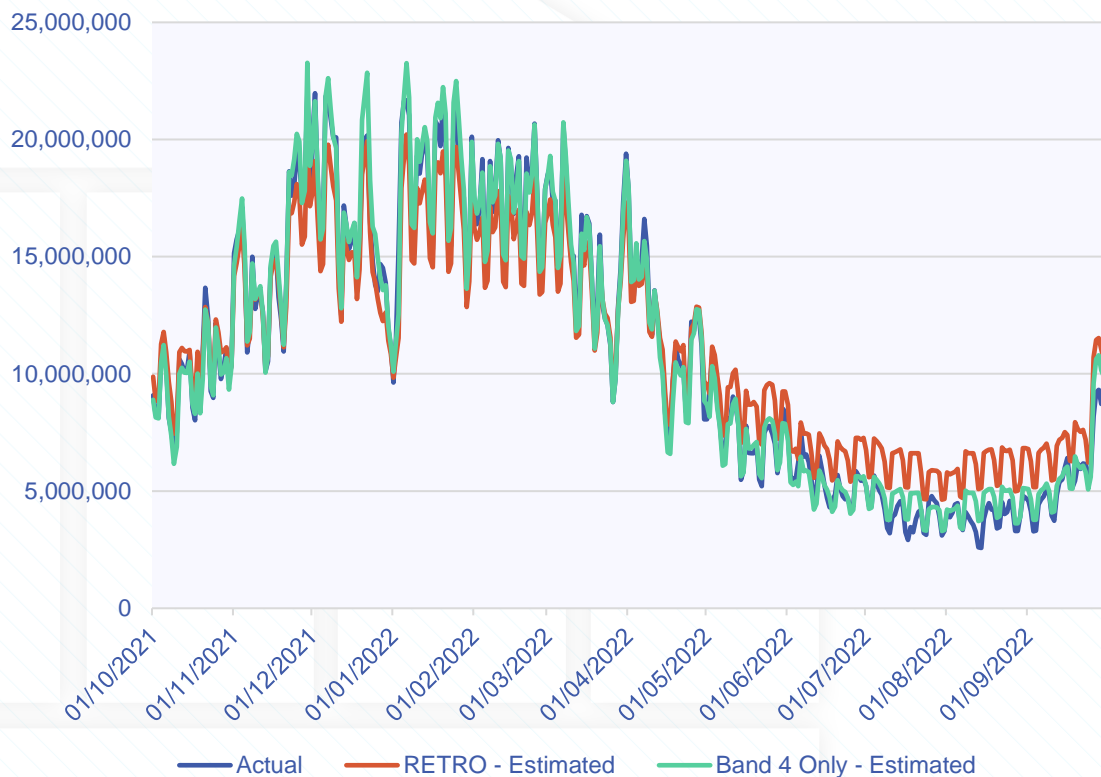


Bands 3 and 4 WAR Band Calculations

- The chart on the right shows the Estimated Volume for Band 4 W01-04 forecast using just Band 4 and using Bands 3 and 4 Combined
- Again, forecasting Band 4 W01-04 separately to Band 3 W01-04 produces a more accurate forecast for Band 4 W01-04 Meters

Model	Modelling Error (MPE)
RETRO	2.6%
Band 4 Only	1.3%

Band 4 W01-04 Actual vs Estimated



Recommendations

Option 1 – Separate Bands 3 and 4 WAR sample data for modelling purposes

- + Improved Algorithm Performance for models
- Additional models to review

Option 2 – Leave Bands 3 and 4 WAR sample data combined for modelling purposes

- + Fewer models to review
- Less accurate models

Correla Recommendation

Bands 5-8 WAR Band Calculations

- Analysis looked into grouping the sample data for EUC Bands 05-08 for WAR Band Forecasting
- This retains more regional integrity as a bigger sample means less aggregation is required
 - See following slide for Sample Counts
- This retains the seasonality as the WAR boundaries ensure meters with similar weather sensitivities are grouped together

WAR Band Forecast Background

- Whilst there are generally enough sample meters for modelling the bucket Bands (e.g. 06B), once this sample is split into WAR Bands, in most cases there are insufficient sample meters for forecasting purposes
- The table on the right shows 20% of the sample, reflecting the smallest samples in the 20%, 30%, 30%, 20% WAR Band aim

Sample Count	05B	06B	07B & 08B
SC	216	79	45
NO	94	40	40
NW	111	53	47
NE	104	48	39
EM	85	55	57
WM	108	38	37
WN	16	2	3
WS	28	18	13
EA	75	32	21
NT	122	32	15
SE	119	30	27
SO	100	46	13
SW	59	31	17

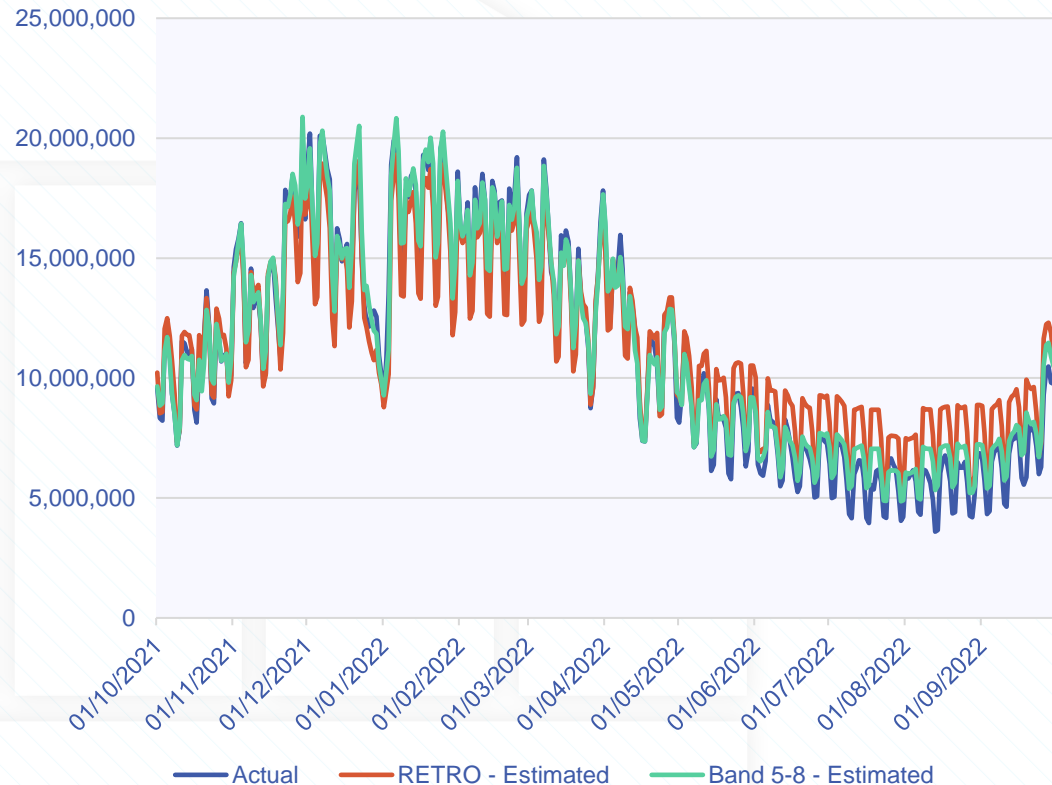


20% of Sample	W01 and W04 Approximate Sample Point Count by Consumption Band		
	05	06	07 & 08
SC	43	16	9
NO	19	8	8
NW	22	11	9
NE	21	10	8
EM	17	11	11
WM	22	8	7
WN	3	0	1
WS	6	4	3
EA	15	6	4
NT	24	6	3
SE	24	6	5
SO	20	9	3
SW	12	6	3

Band 5 WAR Band Calculation Results

05W01-04 Actual Vs Estimated

- The chart on the right shows
 - the actual volume for Band 5 W01-04
 - estimated volumes calculated using only Band 5 sample data (RETRO)
 - calculated using Bands 5-8 Sample data
- The results were better for the summer, but less clear for the winter
- This is aggregated across all LDZs
 - individual LDZ results are covered on the following slide



Band 5 WAR Band Calculation Results

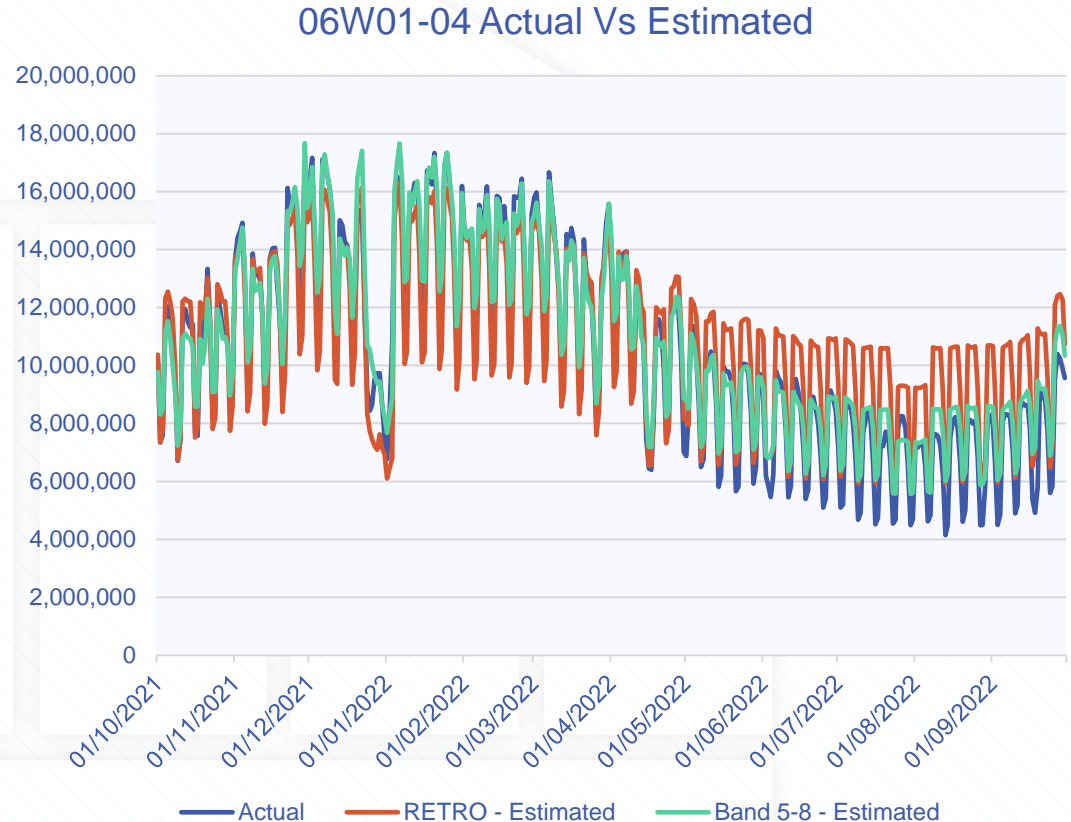
- The table below shows the modelling error change from the existing process of using just 05W01-04 data compared to using Bands 05-08 W01-04 data
- A positive result means the modelling error has increased, therefore the results are not particularly favourable for Band 5

Combining EUCs 05-08 for WAR Modelling Error (MPE) change - 05W01-04



Band 6 WAR Band Calculation Results

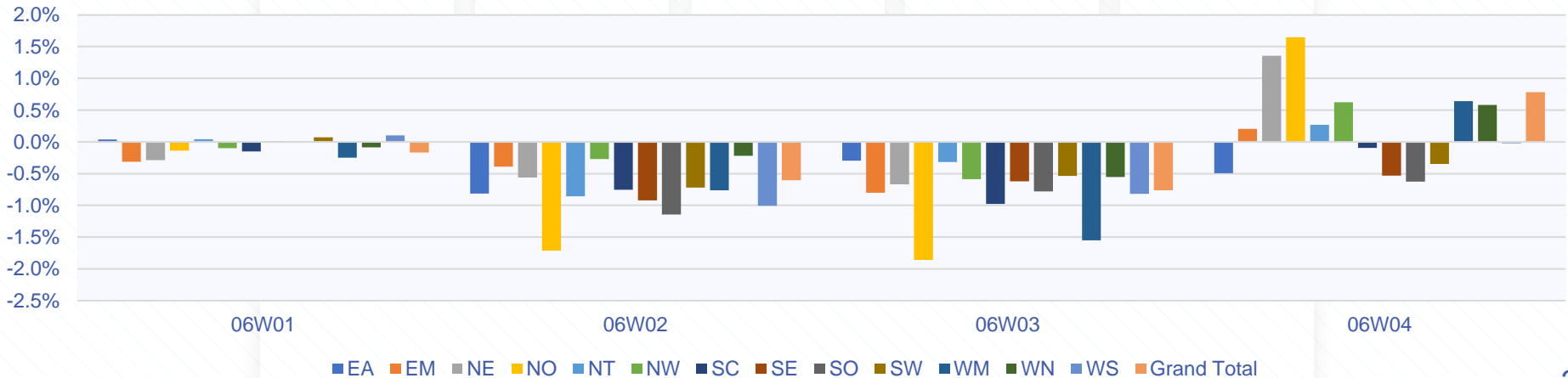
- The chart on the right shows
 - the actual volume for Band 6 W01-04
 - estimated volumes calculated using only Band 6 sample data (RETRO)
 - calculated using Bands 5-8 Sample data
- The results were better for most of the year using more data, particularly summer
- This is aggregated across all LDZs
 - individual LDZ results are covered on the following slide



Band 6 WAR Band Calculation Results

- The table below shows the modelling error change from the existing process of using just 06W01-04 data compared to using Bands 05-08 W01-04 data
- A positive result means the modelling error has increased, therefore the results show an improvement for most LDZ/ WAR Band combinations

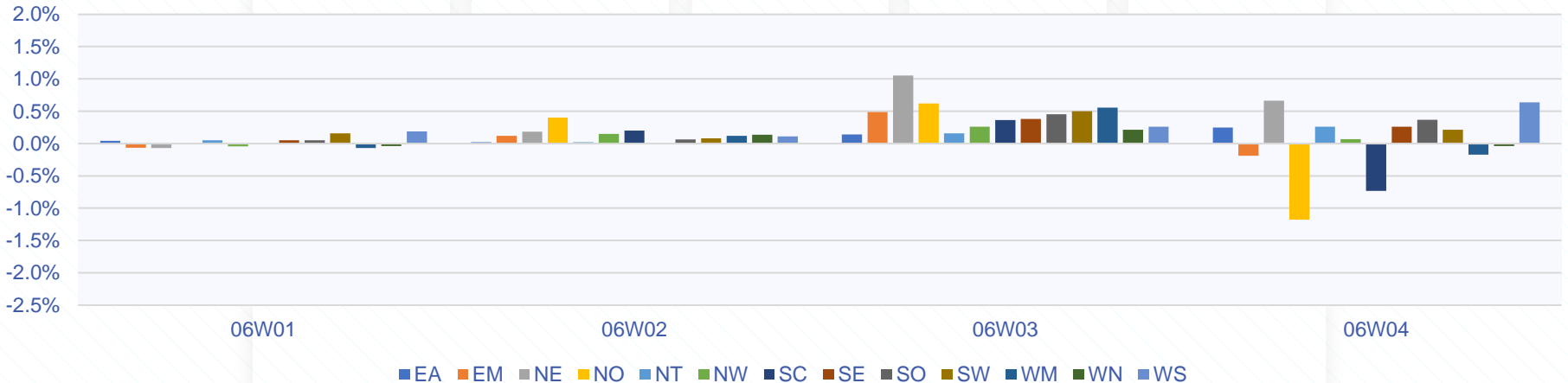
Combining EUCs 05-08 for WAR Modelling Error (MPE) change - 06W01-04



Band 6 WAR Band Calculation Results

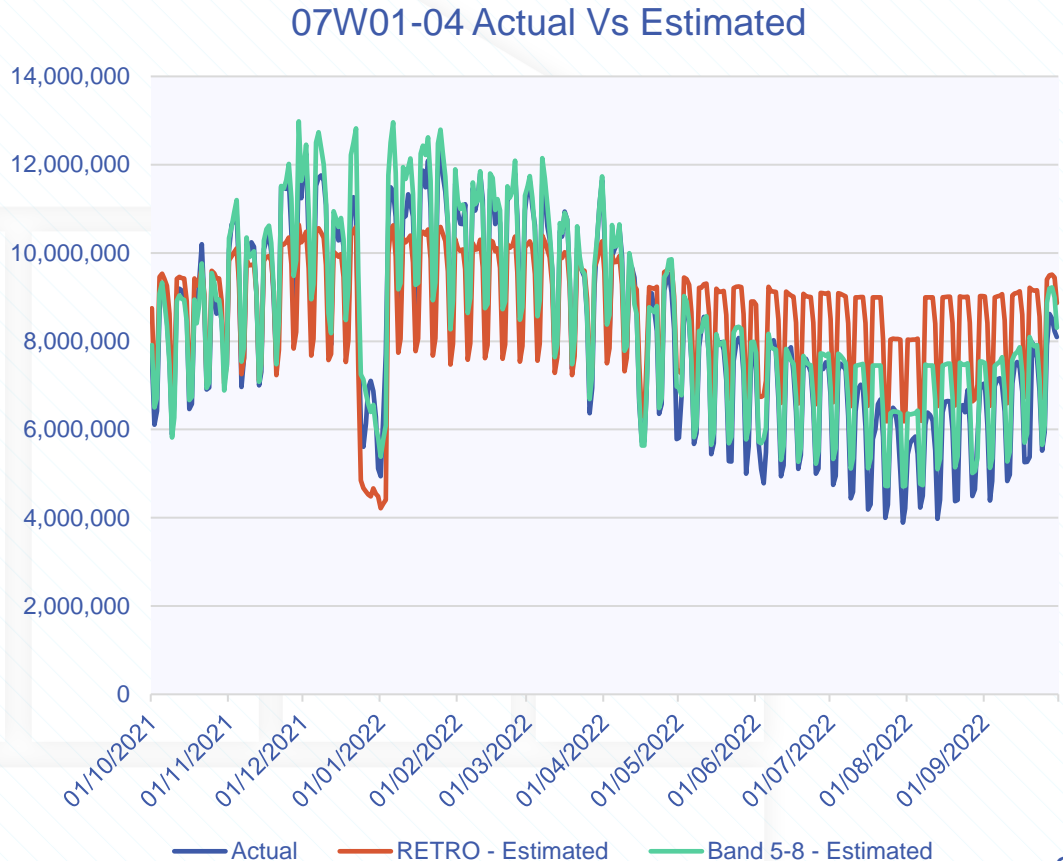
- As the results were less favourable for Band 5, also modelled was using Bands 6-8 W01-04 for WAR Band modelling and leaving Band 5 W01-04 unchanged
- Removing Band 5 from the sample data had a detrimental impact on the results for Band 6

Combining EUCs 06-08 for WAR Modelling Error (MPE) change - 06W01-04



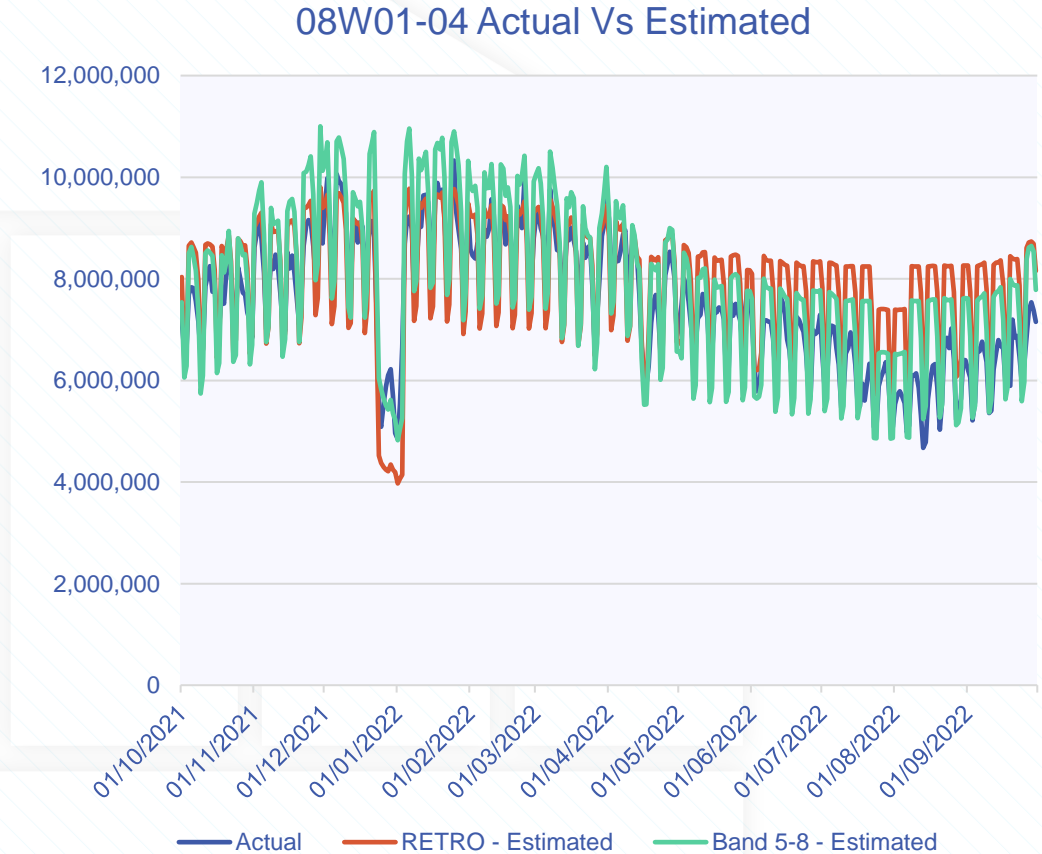
Band 7 WAR Band Calculation Results

- The chart on the right shows
 - the actual volume for Band 7 W01-04
 - estimated volumes calculated using Bands 7 and 8 sample data (RETRO)
 - calculated using Bands 5-8 Sample data
- The results were better for most of the year using more data, particularly summer
- This is aggregated across all LDZs – individual LDZ results are covered on the following slide



Band 8 WAR Band Calculation Results

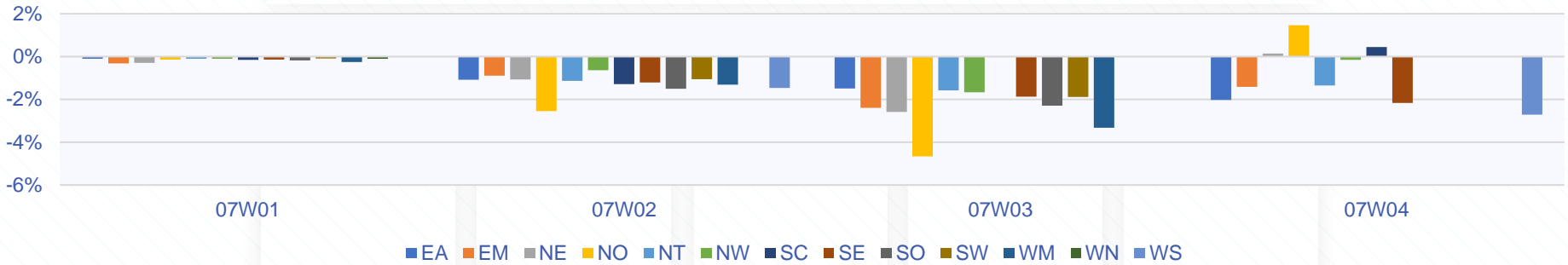
- The chart on the right shows
 - the actual volume for Band 8 W01-04
 - estimated volumes calculated using Bands 7 and 8 sample data (RETRO)
 - calculated using Bands 5-8 Sample data
- The results were better for most of the year using more data, particularly summer
- This is aggregated across all LDZs
 - individual LDZ results are covered on the following slide



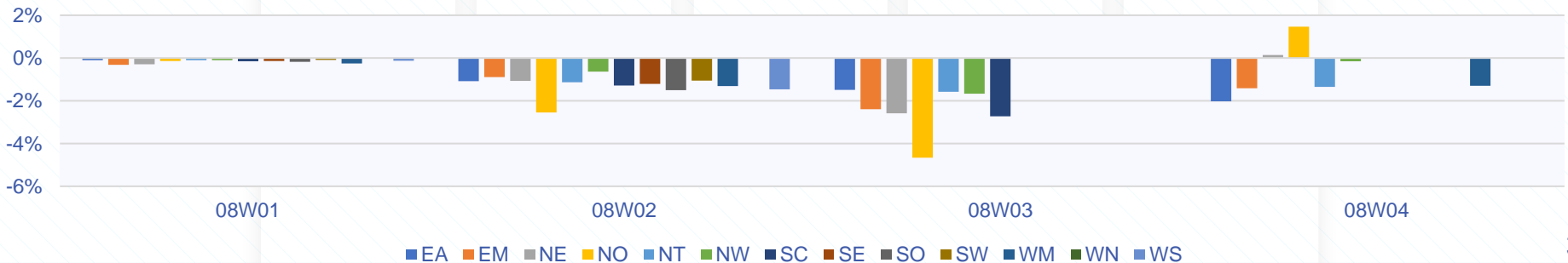
Bands 7 and 8 WAR Band Calculation Results

- The charts show the modelling error change from the existing process of using 07 and 08 W01-04 data compared to using Bands 05-08 W01-04 data
- Results are improved for almost all LDZ WAR combinations
- Note, where there is no bar on the chart, no sample data was available

Combining EUCs 05-08 for WAR Modelling Error (MPE) change - 07W01-04



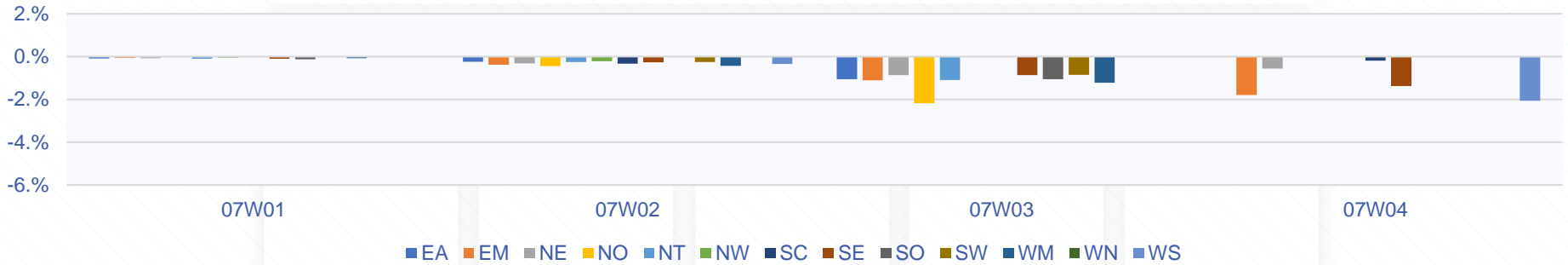
Combining EUCs 05-08 for WAR Modelling Error (MPE) change - 08W01-04



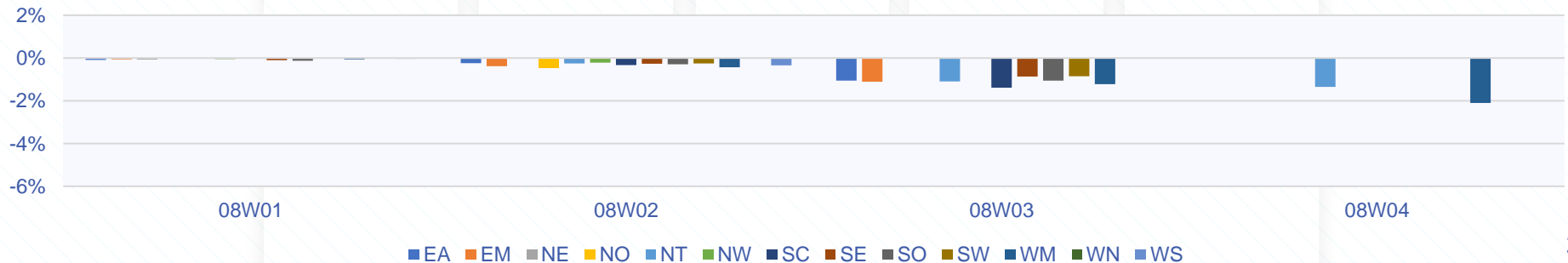
Bands 7 and 8 WAR Band Calculation Results

- The charts show the modelling error change from the existing process of using 07 and 08 W01-04 data compared to using Bands 06-08 W01-04 data
- Results are improved for all LDZ WAR combinations, but to a lesser degree than when combining 05-08 WAR Data

Combining EUCs 06-08 for WAR Modelling Error (MPE) change - 07W01-04



Combining EUCs 06-08 for WAR Modelling Error (MPE) change - 08W01-04



Bands 5-8 WAR Band Calculations

- One option could be using the Band 5 data in the calculation for Band 06-08 W01-04 and also modelling Band 5 W01-04 separately
- This will mean using the Band 5 data in the modelling twice, but results suggests that Bands 6-8 would be improved by the additional data
- The table on the right shows the Modelling Error overall for Bands 05 to 08 WAR Bands
- A hybrid model of combining the sample data for Bands 05 to 08 for modelling 06-08 WAR Bands and also modelling Band 05 W01-04 gives the best results

Modelling Methodology	Modelling Error (MPE)
Current	4.7%
Combining 05-08 W01-04	3.7%
Combining 06-08 W01-04	4.4%
Combining 05-08 for 06-08 W01-04, Model 05 W01-04 Separately	3.6%

Recommendations

Option 1 – Combine Sample data for Bands 05-08
WAR Band Modelling for Bands 06-08 and Model
Band 05 WAR Bands separately

- + Fewer models to review compared to currently
- + Improved Algorithm Performance for majority of models and overall
- Less Consumption Band level granularity

Correla Recommendation

Option 2 – Leave WAR Band Modelling unchanged

- + Consumption Band level granularity for Band 06
- More models to review than Option 1
- Worse Algorithm Performance than Option 1

EUC Band 9 Calculation

- Current analysis is carried out on any meter data received over the maximum volume for EUC Band 8 (58.6m MWh)
- This is often large Daily Metered sites, recent samples contained meters with AQs in excess of 1,500m MWh
- The lack of meters and the potentially limited time meters spend in EUC Band 9, mean Algorithm Performance is not possible
- Proposal is to use the Band 8 ALPs and DAFs for Band 9
 - NOTE: Band 8 is forecast using a combination of sample data for Bands 7 (14.65m to 29.3m MWh) and 8 (29.3m to 58.6m MWh) due to lack of sample data

Recommendations

Option 1 – Use Band 8 ALPs and DAFs for Band 9 meters

- + Fewer models to review
- + Meters will be Non-Daily Metered, like those using the forecasts
- All meters in the sample will have lower AQs than Band 9

Option 2 – Continue to use DM data received to Forecast Band 9

- + Some meters in the sample are likely to be a similar volume to those in Band 9
- Majority of meters are Daily Metered with significantly larger AQs than Band 9 meters

Correla Recommendation

Action 0704

- CDSP to consider providing DESC Members with a list of data sets which would assist reviewing EUC definitions
- We would be grateful for any insight on the consumption patterns of Domestic meters DESC members can provide
 - Are you aware how many meters are cooking or heating only?
 - Do you see different seasonal consumption behaviour and are you able to identify the meters in each segment
 - Are you able to provide us with daily consumption data for these meters
- We suggest revisiting the Domestic meter segmentation at a later date – possible future Ad Hoc Workplan item