



## **Demand Estimation Sub Committee**

**NDM Algorithm Performance (Gas Year 2017/18)  
Strand 3 Analysis – NDM Daily Demand Analysis**

**10<sup>th</sup> December 2018**

# Strand 3 – NDM Daily Demand Analysis

## Background:

- An evaluation of the NDM Supply Meter Point Demand formula by comparing actual daily demands for NDM supply meter points with estimates of their daily demands across the range of EUCs

## Objective:

- Assess accuracy of the algorithms for Gas Year 2017/18
- Identify possible areas of improvement for future demand modelling

## Note:

- Assessment is made on supply meter points which comprise the Demand Estimation Sample and data provided (voluntarily) by shippers

## Strand 3: Approach

Analysis has taken the following approach:

- Daily NDM consumption data obtained for Gas Year 2017/18
- Validation applied to all daily NDM consumption data in order to exclude sites with suspicious or erroneous data (e.g. too many missing records)
- Calculate the % error of consumption against two bases:
  - **MODEL**: Allocated using 2017/18 ALPs, DAFs and WCFs; NDM sample derived AQs
  - **RETRO**: Allocated using 2018/19 ALPs, DAFs (adjusted to day/holiday pattern in 2017/18); WCFs and NDM sample derived AQs
- Assessments conducted by EUC (bucket bands only) for all LDZs for full year, summer/winter, month and day of the week

# Strand 3: Original Data Summary

- Daily NDM consumption data for Gas Year 2017/18 was available from the following three sources:
  - Xoserve Managed; Network Managed & Third Party Provided
- Validation excludes Supply Meter Points which are deemed not usable
  - i.e. insufficient data; excessive consecutive zero consumption; excessive consumption spikes; non-NDM sites
- Table below summarises the Supply Meter Point counts

Source	Xoserve Managed	Network Managed	3rd Party Provided	Total
Initial SP Count of Available Data	3,230	14,079	15,441	32,750
Final SP Count of Usable Data	1,966	5,949	11,216	19,131
% Deemed Usable	61%	42%	73%	58%

# Strand 3: Data Errors for Awareness

Validation of the data used in this analysis has highlighted the following anomalies:

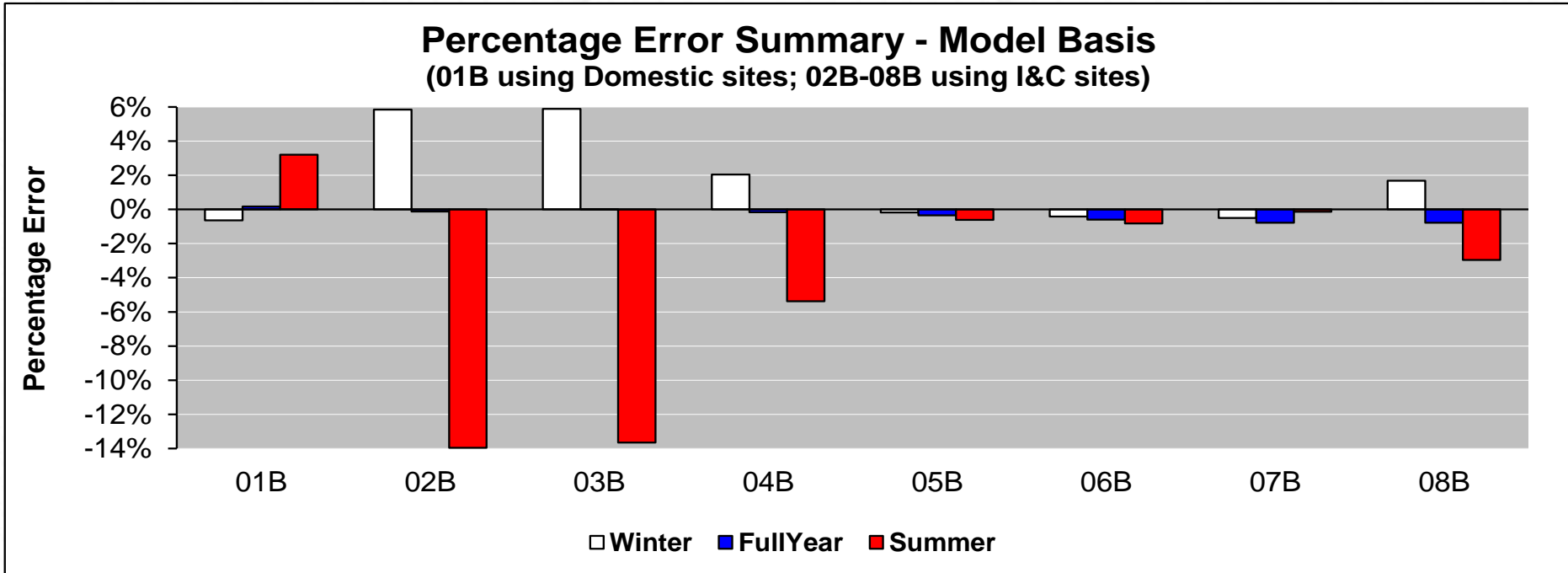
- Multiple days gas consumption recorded against a single gas day
  - Data from a Third Party displayed unusual aggregated consumption pattern on several days
  - Appears that multiple days consumption from consecutive missing days had been recorded against the next available gas day
  - Data rejected from analysis
- Day of the week pattern
  - Data from a Third Party displayed unusual day of the week pattern
  - Data provided against Gas Day, not Read Date
  - Dates adjusted to enable use of the data
- 'Market Sector Flag' inaccuracies on UKLink
  - Indicates if Supply Meter Point is 'Domestic' or 'Industrial & Commercial'
  - Historically not a critical data item but soon will be used in applying new EUC profiles
  - Data excluded from analysis (where known)

# Strand 3: Validated Data Breakdown

EUC	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW	ALL LDZs	% Non-Third Party	% Third Party
01B Dom	221	195	207	225	208	229	54	196	240	212	234	248	244	2,713	68%	32%
01B I&C	475	120	202	124	228	248	39	103	326	276	239	225	176	2,781	12%	88%
02B Dom	3	2	1	2	3	4	0	0	2	6	10	1	1	35	34%	66%
02B I&C	871	205	410	231	505	465	40	95	570	437	402	357	328	4,916	13%	87%
03B I&C	891	143	251	182	282	243	37	65	265	267	307	242	212	3,387	32%	68%
04B I&C	641	238	234	292	181	217	31	79	217	243	381	289	168	3,211	67%	33%
05B I&C	240	107	104	142	98	107	16	35	72	114	146	111	55	1,347	86%	14%
06B I&C	88	42	36	45	47	46	8	15	24	41	38	41	27	498	93%	7%
07B I&C	26	11	15	26	24	10	1	4	8	4	14	9	16	168	96%	4%
08B I&C	8	4	7	6	15	15	0	4	1	4	4	3	4	75	99%	1%
Total	3,464	1,067	1,467	1,275	1,591	1,584	226	596	1,725	1,604	1,775	1,526	1,231	19,131		

- Table shows breakdown of validated sample sites available for analysis
- Some EUC & LDZ combinations contain either no sample data and therefore no analysis is possible or very few validated sample points, which can skew the results significantly
- Analysis of Band 09 has not been performed due to small number of NDM supply points

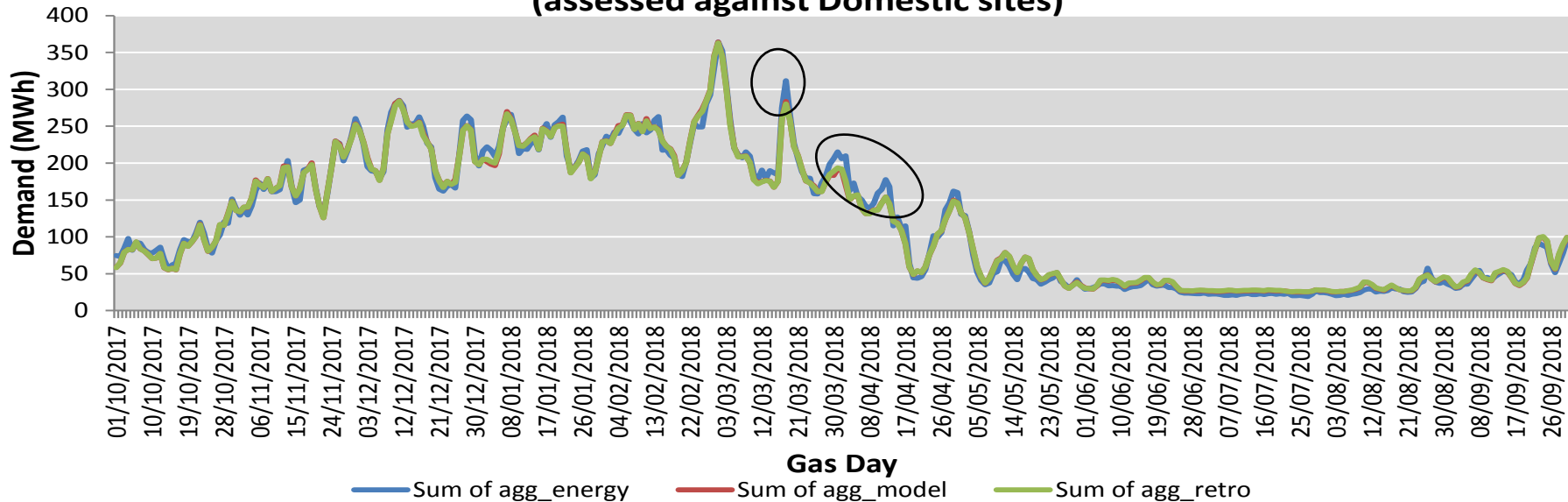
# Strand 3: EUC Band Summary - Model



- Chart shows simple summary of the overall error on the 'Model' basis (weighted average across all LDZs)
- Profiles for bands 01 & 07 were a little too flat and profiles for remaining bands were too peaky
- High summer errors in 02B & 03B influenced by inclusion of many sites with a flatter consumption profile
- By excluding Third party data, absolute difference of winter and summer error reduces from 19.8% to 2.8% for 02B and reduces from 19.5% to 8.2% for 03B

# Strand 3: Band 01B Analysis

## Daily Actual & Deemed Demands - Band 01B (assessed against Domestic sites)

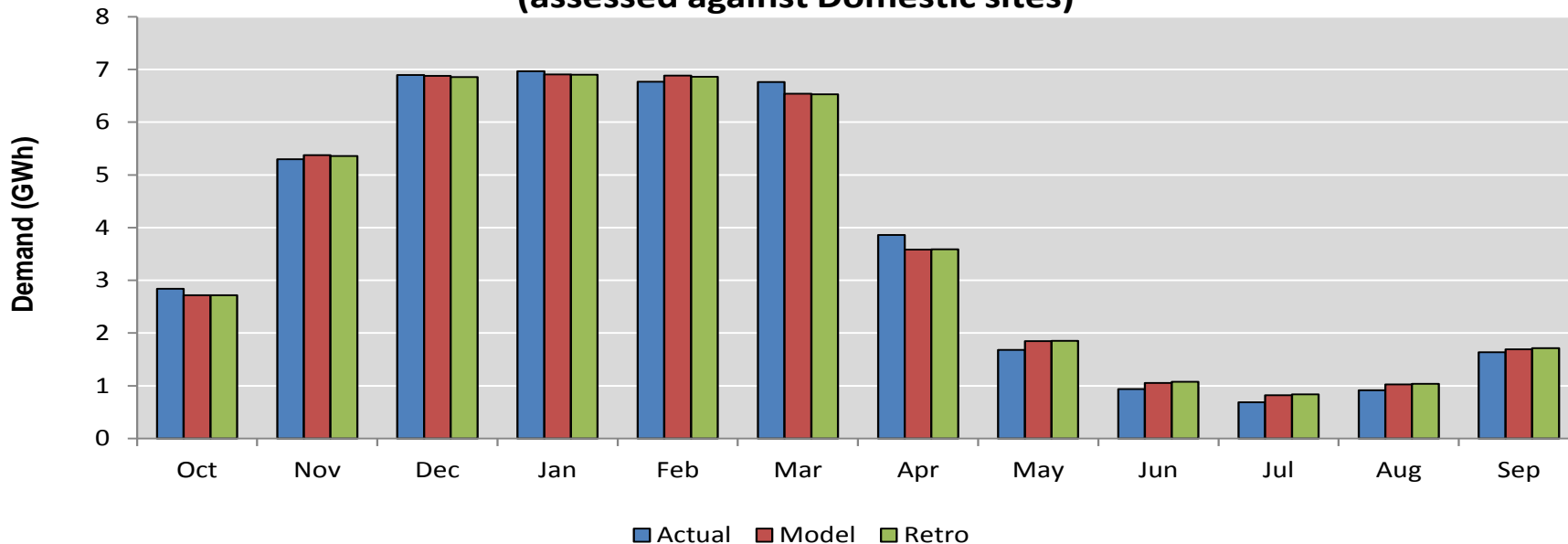


- Chart shows daily actual and allocated demand (Model & Retro basis) for Band 01B against Domestic sites
- Shows allocated demand was generally close to actual demand
- Most notable exceptions occurred during the colder spells during the weekend of 17<sup>th</sup> & 18<sup>th</sup> March 2018 (incl. widespread snow) and from 29<sup>th</sup> March to 2<sup>nd</sup> April 2018



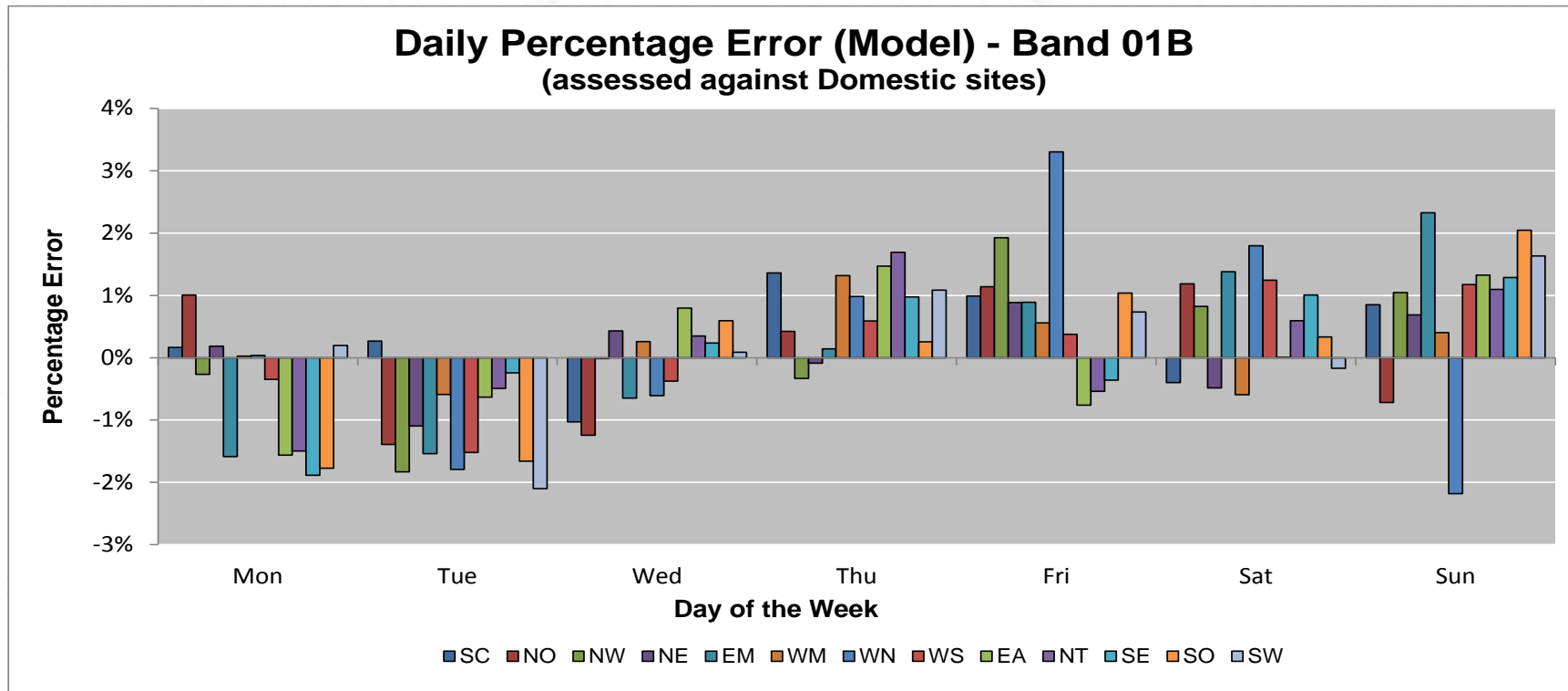
# Strand 3: Band 01B Analysis

## Monthly Actual & Deemed Demands - Band 01B (assessed against Domestic sites)



- Chart shows monthly actual and allocated demand (Model & Retro basis) for Band 01B against Domestic sites
- During winter months, under allocation was evident in October, December, January and March whilst in the summer months over allocation was present from May through to September

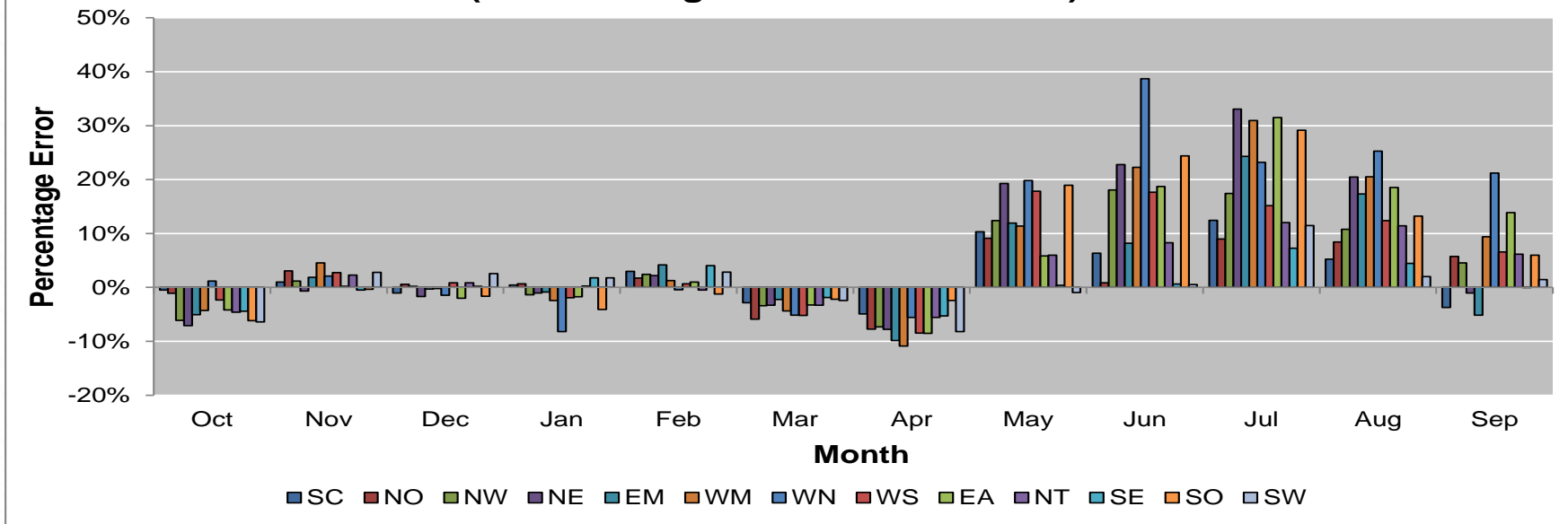
# Strand 3: Band 01B Analysis



- Chart shows % errors over the days of the week, by LDZ, for Band 01B
- Shows mostly under allocation from Monday to Wednesday and over allocation from Thursday to Sunday

# Strand 3: Band 01B Analysis

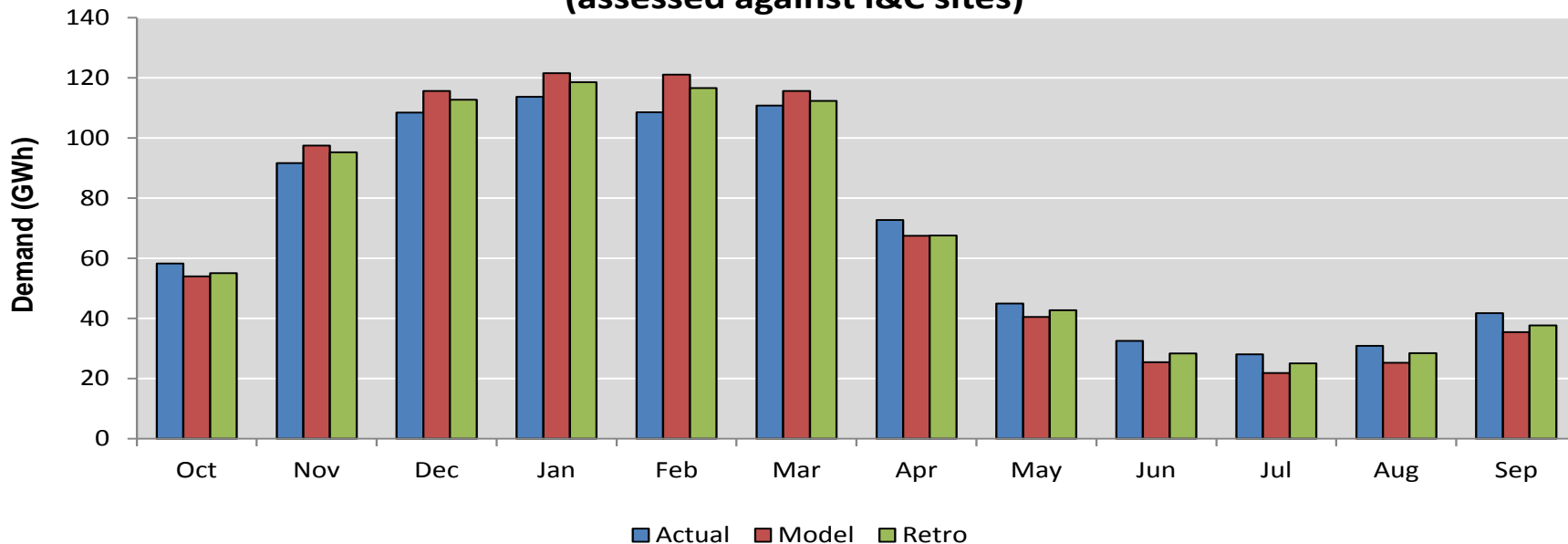
## Monthly Percentage Error (Model) - Band 01B (assessed against Domestic sites)



- Chart shows % errors for each month for Band 01B on the 'Model' basis
- Indicates mostly winter under allocation in Oct'17, Dec'17, Jan'18 and March'18 but mostly over allocation in Nov'18 and Feb'18
- During the summer months, mostly over allocation from May'18 to Sep'18 with April'18 displaying under allocation (Summer demands are lower and hence percentage errors can be somewhat greater)

# Strand 3: Band 02B Analysis

## Monthly Actual & Deemed Demands - Band 02B (assessed against I&C sites)



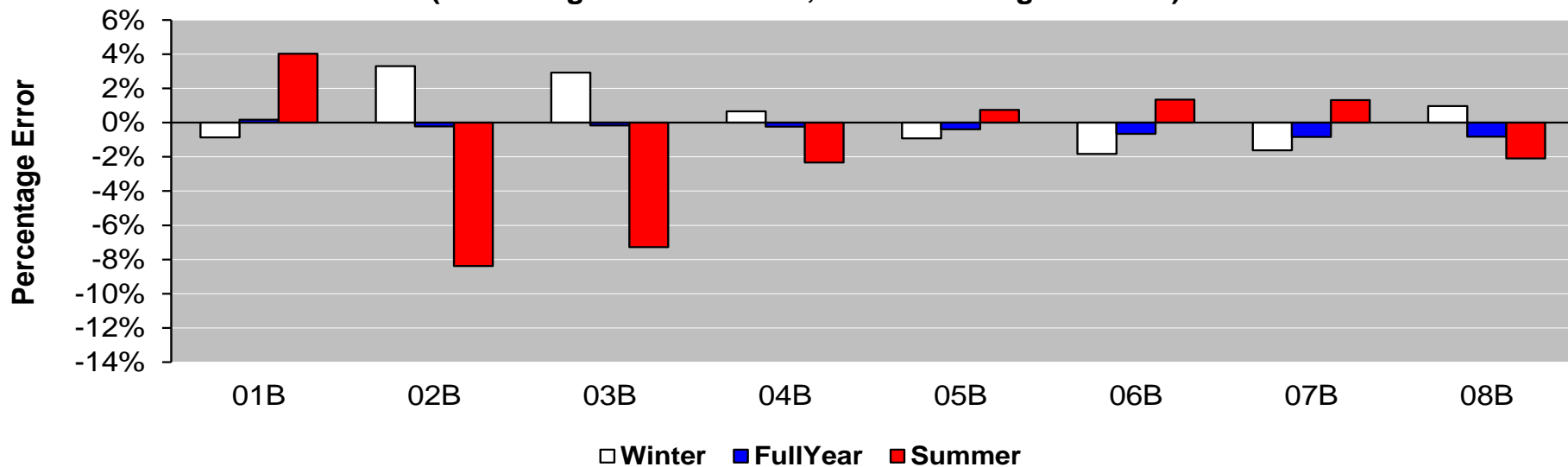
- Chart shows monthly actual and allocated demand (Model & Retro basis) for Band 02B against I&C sites
- Indicates winter over allocation from November to March and under allocation for each of the summer months
- Retro analysis shows 2018/19 profiles have become flatter providing a better fit

# Strand 3: Retro Basis Analysis

- The 'Retro' analysis is based on the algorithms derived for the current gas year (i.e. 2018/19) but retro fitted with appropriate adjustment for the pattern of days of the week and holidays for gas year 2017/18
- This analysis is helpful in assessing the performance of the most current algorithms had they applied to the gas year being analysed
- In addition, analysis of the additional EUC profiles (developed in Spring 2018) for Band 01 & 02 has been performed

# Strand 3: EUC Band Summary - Retro

**Percentage Error Summary - Retro Basis**  
(01B using Domestic sites; 02B-08B using I&C sites)



- Chart shows the results for algorithms derived for Gas Year 2018/19 (if applied to gas year 2017/18)
- Winter / Summer period errors are notably improved (compared to Model basis) for bands 02, 03, 04 & 08 and are slightly worse for bands 01, 05, 06 & 07
- Almost all profiles for 2018/19 were flatter overall compared to 2017/18 (particularly for 02B & 03B)

# Strand 3: Band 01B Analysis - Retro

Row Label	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SC	-0.19%	-0.29%	0.21%	-0.40%	-0.42%	0.25%	0.08%	0.40%	1.69%	3.51%	1.56%	-0.58%
NO	-0.50%	-0.29%	-0.52%	-0.25%	-0.45%	0.24%	-0.25%	0.49%	2.61%	3.67%	2.34%	1.33%
NW	-0.57%	-0.68%	0.54%	0.84%	-1.08%	0.60%	-0.54%	1.58%	6.29%	8.86%	5.39%	1.86%
NE	-0.17%	0.14%	-0.12%	-0.02%	-0.23%	0.09%	-0.09%	-0.74%	1.37%	1.85%	0.70%	-0.52%
EM	1.84%	-0.63%	0.31%	0.15%	-0.28%	0.09%	0.44%	-4.12%	5.23%	4.24%	2.81%	-2.38%
WM	-0.14%	-0.26%	0.29%	0.05%	-0.34%	0.14%	-0.14%	0.70%	1.90%	1.80%	2.23%	0.63%
WN	0.61%	-0.69%	0.97%	0.78%	1.05%	0.59%	-0.55%	1.69%	7.38%	9.30%	6.10%	2.16%
WS	0.12%	-0.11%	-0.21%	-0.24%	-0.11%	-0.05%	-0.13%	0.07%	-0.13%	0.25%	0.62%	-0.20%
EA	-0.34%	-0.20%	0.35%	0.07%	-0.38%	0.13%	-0.50%	0.58%	1.85%	0.89%	0.09%	1.13%
NT	-0.31%	-0.30%	-0.74%	-0.06%	0.44%	0.07%	-0.69%	0.78%	2.01%	2.35%	1.24%	1.13%
SE	-0.40%	0.51%	0.37%	-0.37%	-0.76%	0.33%	-0.67%	1.43%	3.06%	3.82%	3.70%	1.55%
SO	0.43%	-0.19%	-0.33%	-0.70%	-0.36%	-0.15%	0.48%	-1.06%	-2.34%	-2.13%	-1.56%	-1.25%
SW	-0.11%	-0.07%	-0.28%	0.07%	-0.12%	0.04%	0.00%	-0.29%	0.62%	0.16%	1.05%	0.36%

- Table shows comparison of Band 01 errors from the 'MODEL' and 'RETRO' analysis
- Green denotes an improvement; Red denotes a worsening
- Months with the most notable improvements were November 2017 & February 2018 (11 out of 13 LDZs improved) and April 2018 (10 out of 13 LDZs improved)
- Months that saw errors deteriorate the most were July & August 2018 (12 of the 13 LDZs worsened) and March and June 2018 (11 out of 13 LDZs worsened)

# Strand 3: 2016/17 vs 2017/18 - Retro

EUC	Gas Year 2016/17 (excl Third Party Data)		Gas Year 2016/17 (Third Party Data)		Gas Year 2017/18 (excl Third Party Data)		Gas Year 2017/18 (Third Party Data)	
	Absolute Retro diff (winter - summer)	Sample Count	Absolute Retro diff (winter - summer)	Sample Count	Absolute Retro diff (winter - summer)	Sample Count	Absolute Retro diff (winter - summer)	Sample Count
01B	1.18%	2,338	8.99%	767	3.52%	1,820	8.56%	873
02B	2.02%	1,510	10.40%	4,945	6.70%	636	14.37%	4,280
03B	2.30%	1,465	2.86%	2,264	2.70%	1,087	16.17%	2,300
04B	1.90%	2,609	5.69%	1,212	1.18%	2,141	6.78%	1,070
05B	1.36%	1,436	2.05%	250	3.38%	1,154	8.63%	193
06B	1.53%	700	11.89%	84	4.45%	462	7.21%	36
07B	3.71%	356	14.48%	21	3.14%	162	1.60%	6
08B	2.61%	230	n/a	n/a	2.87%	74	17.02%	1

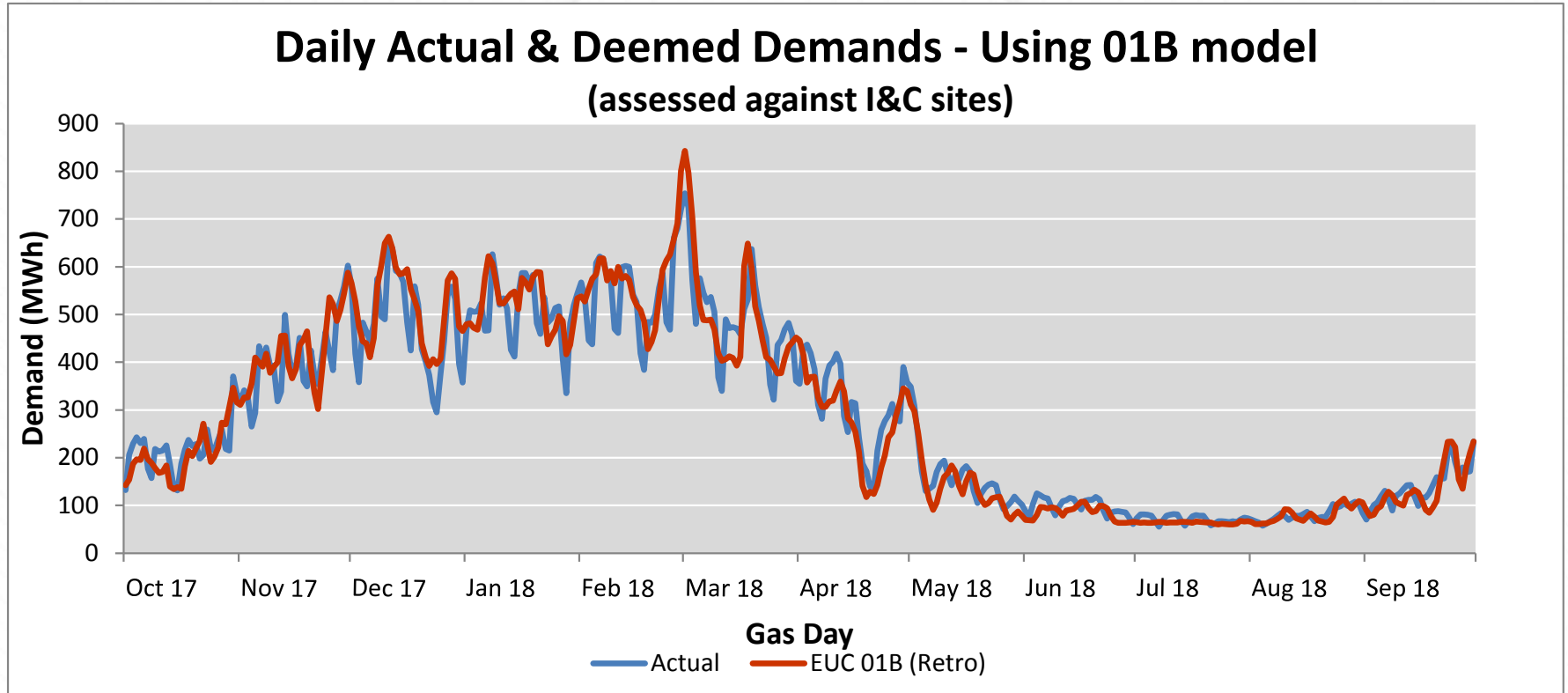
- Table shows absolute difference of winter and summer error from the analysis performed last year (for Gas Year 2016/17) and the results from this years analysis (for Gas Year 2017/18)
- Results show the make up of NDM sample sites from different data sources can influence the analysis results



# Strand 3: Retro Analysis of New EUC profiles

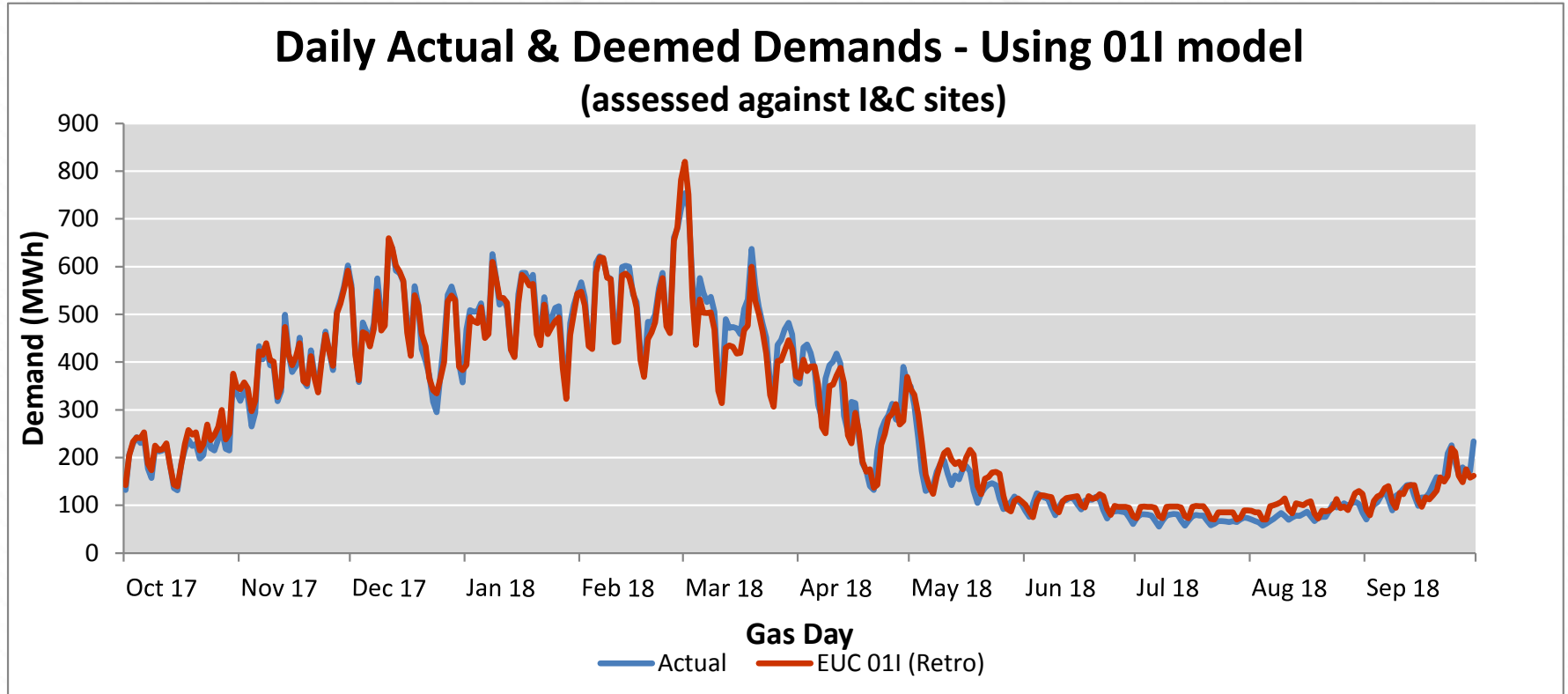
- Change proposal XRN4665 introduces additional EUC profiles for Band 01 & 02
  - EUC01P / EUC02P – For prepayment heating load
  - EUC01I / EUC02I – For Market Sector Code of 'I&C' heating load
  - EUC01B / EUC02B – For all remaining MPRs
- The additional profiles were developed in Spring 2018, however changes required to UKLink and lack of industry readiness meant they could not be used for Gas Year 2018/19
- Analysis of the EUC01I & EUC02D profiles has been performed (on the Retro basis) using the available Daily NDM consumption data for Gas Year 2017/18:
  - 2,781 I&C sites in Band 01
  - 23 Domestic sites in Band 02 (12 sites excluded as incorrectly classed as Domestic)

# Strand 3: Retro Analysis - I&C Sites in Band 01



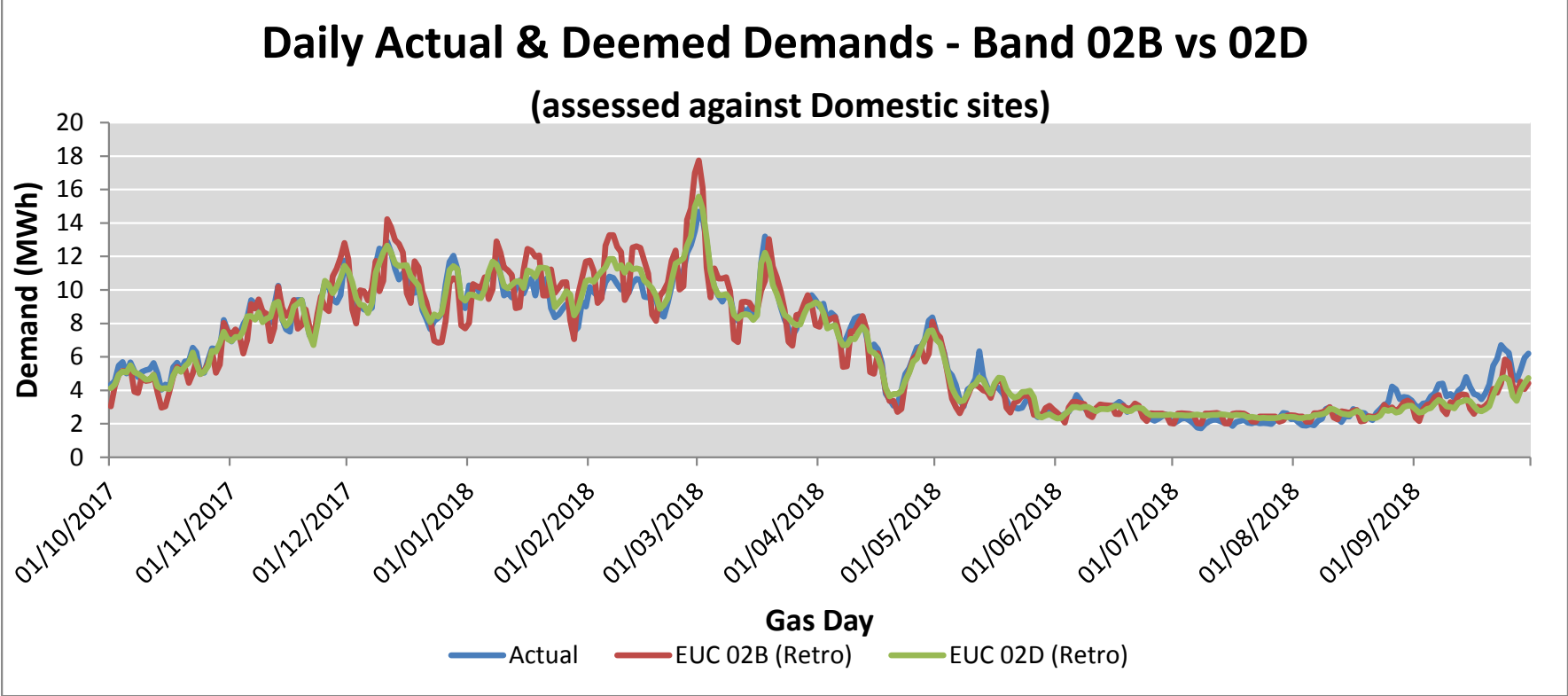
- Chart shows daily actual and allocated demand (using 01B profile) for 2,781 I&C sites in Band 01

# Strand 3: Retro Analysis - I&C Sites in Band 01



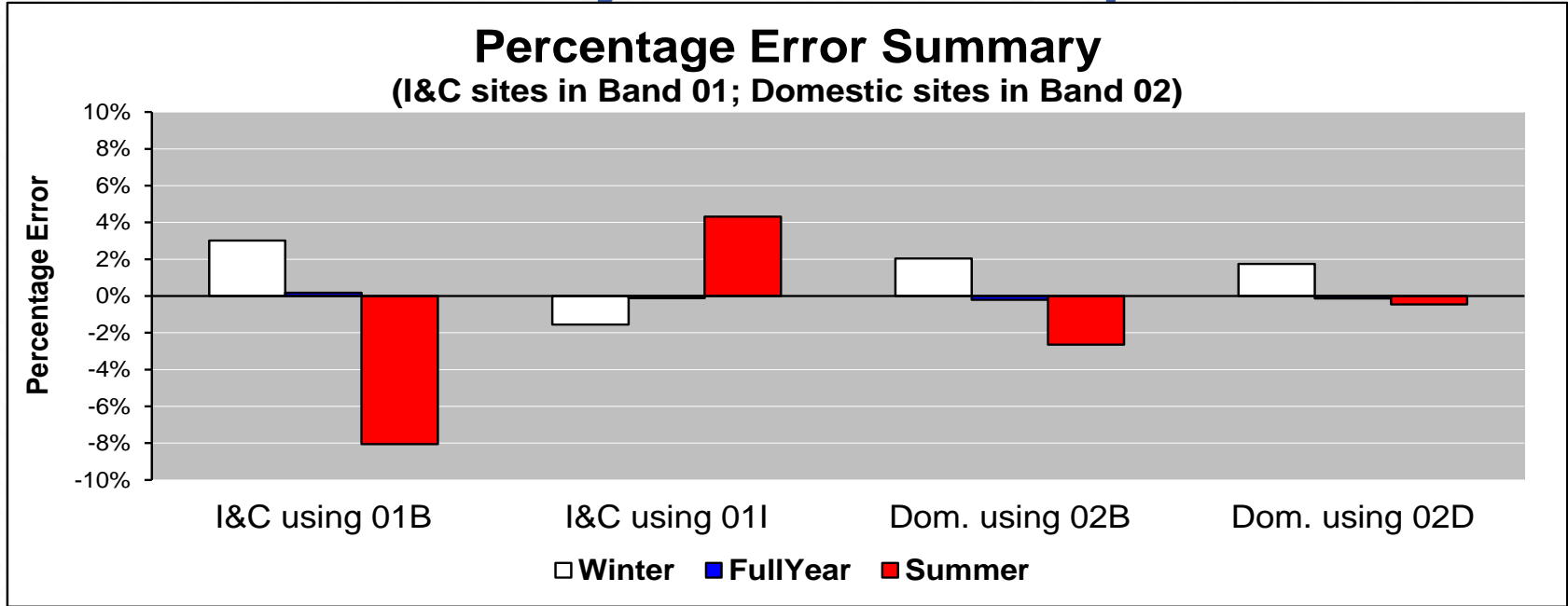
- Chart shows notable improvements by applying the 01I profile to I&C sites in Band 01
- Improvements would be seen against c538k Supply Meter Points

# Strand 3: Retro Analysis – Domestic sites in Band 02



- Chart shows daily actual and allocated demands for 23 Domestic sites in Band 02
- Improvements to allocation are clearly evident despite the small number of sites

# Strand 3: Retro Analysis - New EUC profiles Summary



- Chart shows summary of overall error for existing vs additional EUC profiles for Band 01 & 02
- Table shows absolute difference of winter and summer error demonstrating the tangible benefit of applying the additional profiles

EUC	Winter	FullYear	Summer	Absolute Diff (winter - summer)
I&C sites - 01B	3.02%	0.18%	-8.05%	11.07%
I&C sites - 01I	-1.55%	-0.12%	4.32%	5.87%
Dom sites - 02B	2.04%	-0.20%	-2.65%	4.69%
Dom sites - 02D	1.75%	-0.12%	-0.46%	2.21%

# Strand 3: Conclusions

## NDM Daily Demand Analysis suggests:

- Bands 01 & 07 the models (on Model & Retro assessments) have a tendency to under allocate in winter & over allocate in summer (i.e. profile is too flat)
- Bands 02, 03, 04 & 08 the models (on Model & Retro assessments) are too peaky
- Bands 05 & 06 the models were slightly too peaky on Model assessment however analysis on Retro basis suggested models were slightly too flat

## Analysis of New EUC Profiles

- Allocation using specific new profiles for I&C sites in Band 01 and Domestic sites in Band 02 showed improvement during winter and summer which supports DESC's approach of creating additional EUCs in Bands 1 and 2

## Additional Data

- Including an increased amount of Third party sourced NDM sample data in future modelling will help make the profiles even more representative of the population as a whole

## Strand 3: Considerations

### Caveats for consideration:

- NDM Daily Demand analysis is based on validated NDM SAMPLE data, which despite our attempts, may not be necessarily be representative of the population as a whole
- Data validation attempts to remove erroneous Supply Points from the analysis, however data errors can slip through and will affect the perceived results

### DESC Members to consider:

- Is there anything that should be included in the 2019 Spring Approach? (within the current process framework)
- Is there any further Ad-hoc work which might influence a future year's modelling?