EVALUATION OF ALGORITHM PERFORMANCE - GAS YEAR 2016/17 STRAND 3

1. BACKGROUND

One of the responsibilities of the Demand Estimation Sub Committee (DESC) is to provide a summary of the NDM Algorithm Performance in the preceding year. UNC requirement 'H 1.8.1 (d)' states "DESC will submit to all parties a summary of the Committee's analysis of the performance in the Preceding Year of the End User Categories and Demand Models (applicable in the Preceding Year)".

The analysis is completed once a year in the Autumn, following completion of the gas year and Xoserve performs this role as the common demand estimation service provider.

The implementation of Project Nexus on 1st June 2017 introduced a revised NDM Supply Meter Point Demand formula, meaning some of the original Algorithm Performance measures became redundant. At the DESC meeting on 15th November 2016, the group reviewed four proposed strands of analysis which would help assess the accuracy of the estimated allocations derived by the revised formula. These analysis strands are as follows:

Strand 1 – Weather Analysis

Strand 2 – Unidentified Gas Analysis

Strand 3 – NDM Daily Demand Analysis

Strand 4 – Reconciliation Analysis

This document presents the results of Strand 3 (NDM Daily Demand Analysis) which assesses the accuracy of the NDM Supply Meter Point Demand Formula.

2. NDM SUPPLY METER POINT DEMAND FORMULA

The revised NDM Supply Meter Point Demand formula (effective from 1st June 2017) used for estimating NDM daily demand is shown below:

$SPD_t = ((AQ/365) \times ALP_t \times (1 + (DAF_t \times WCF_t)))$

where:

AQ = Annual Quantity

ALP_t = Annual Load Profile

DAF_t = Daily Adjustment Factor ($WVCE_t$ / $SNDE_t$)

WCF_t = Weather Correction Factor (CWV_t – $SNCWV_t$)

In addition to the revised demand formula, 1st June 2017 also saw the introduction of Unidentified Gas or UiG. UiG forms part of daily gas allocation and is calculated as the balancing figure to ensure that within in each LDZ, total input matches total output. UiG is derived as follows:

Total LDZ Energy – (Shrinkage + DM Energy + Total LDZ NDM Energy) = UiG

3. STRAND 3: NDM DAILY DEMAND ANALYSIS

The performance of the NDM Supply Meter Point Demand Formula has been evaluated by comparing actual daily demands for supply points in the NDM sample with estimates of their daily demands (as per the NDM demand formula) across the range of EUCs (bucket bands only). This evaluation covers the period of the gas year 2016/17.

The performance of the algorithms has been evaluated on two bases:

i) MODEL - gas year 2016/17 ALPs, post Nexus DAFs and WCFs (i.e. CWV minus SNCWV) and NDM sample derived AQs

ii) RETRO - gas year 2017/18 ALPs and DAFs (adjusted to apply to pattern of days/holidays in 2016/17), post Nexus WCFs (i.e. CWV minus SNCWV) and NDM sample derived AQs

The 'MODEL' analysis is based on the algorithms that applied to the gas year being analysed (i.e. 2016/17). The DAF and WCF values used in the analysis were post Nexus values applicable for gas year 2016/17 (the formula for the ALP values did not change). The AQs used in the analysis are based on the consumption data of the sample itself rather than system AQs, which removes bias which might be introduced as a result of any erroneous AQs.

The 'RETRO' analysis is based on the algorithms derived for the current gas year (i.e. 2017/18) but retro fitted with appropriate adjustment for the pattern of days of the week and holidays for gas year 2016/17. This analysis is helpful in assessing the performance of the most current algorithms had they applied to the gas year being analysed.

For months prior to Project Nexus go-live, the outcome of the post-Nexus algorithms was simulated for use in this analysis, in order to have a full Gas Year of data to use for comparison.

Analysis is performed on supply meter points which comprise the Demand Estimation Sample, where actual daily consumption values are known for days within the gas year being analysed. Only supply meter points that are NDM and have passed data validation can be used. Figure S12.65 shows the number of validated supply meter points, by LDZ and EUC band, which have been used in this NDM Daily Demand Analysis. It is worth noting at the outset that no sample data exists in Band 01 for WN LDZ and therefore no analysis has been performed. Additionally, results for band 09 are unreliable and are disregarded in this assessment, as this band is represented by a very small number of supply meter points distributed in only some of the 13 LDZs. Analysis has been performed on bucket band EUCs only, as generally the number of validated supply meter points available are not sufficient to perform analysis on WAR (Winter Annual Ratio) band EUCs.

Figures S12.66 to S12.73 are graphs showing actual demand and allocated demand on the 'MODEL' and 'RETRO' basis for each consumption band. In general, the allocated demand for both bases was close to the actual demand for each consumption band on most days. For band 01, the most notable exceptions occurred during the much warmer weather from late March through to mid-April 2017. Band 02 displays a tendency for slight under allocation during the winter months and slight over allocation in the summer months. For bands 03, 04 and 08 there appears to be a tendency for slight over allocation during the winter and slight under allocation in the summer. Finally, bands 05, 06 and 07 show a tendency for over allocation in the winter and in the summer months.

Tables showing the error ("allocated-actual") expressed as a percentage of full year demand, for the whole year and for winter and summer separately, for each of the two bases, are attached as Figures S12.74 to S12.79. Note that positive errors denote over allocation whereas negative errors denote under allocation by the algorithms. Additionally, due to its significance in throughput terms, Figure S12.80 shows the percentage error of full year demand, by LDZ and month, for consumption band 01 for the 'MODEL' basis and Figure S12.81 shows the same assessment but for the 'RETRO' basis. Full year errors for bands 07 and 08 on the 'MODEL' and 'RETRO' basis (tables S12.74 and S12.77) are identical across each individual LDZ, since these bands were originally modelled together and therefore use the same ALP and DAF values.

Figures S12.82 and S12.83 are bar charts showing a simple summary of the overall picture given by these two sets of tables, achieved using a weighted average error across LDZs based on validated supply meter points. The overall error and apparent winter/summer bias for EUCs in each consumption band is shown averaged across all LDZs (excluding WN LDZ for which there is no data for band 01).

The bar chart in Figure S12.82 shows that for the 'MODEL' analysis the percentage errors over the 12 month period as a whole are negative in bands 01 and 03 and positive in bands 02, 04, 05, 06, 07 and 08. Full year errors range between -0.18% and +1.19% for all bands. The winter errors are negative in bands 01 and 02 but positive in the remaining bands and summer errors are negative in bands 01, 03, 04 and 08 but positive in bands 02, 05, 06 and 07.

3.1 Analysis

On the evidence of the bar chart in Figure S12.82 (MODEL), there was very little overall error in the algorithms for any of the consumption bands over the whole of gas year 2016/17 (full year errors range between -0.18% and +1.19% for all bands). The relatively small negative errors over 12 months in consumption bands 01 and 03 (-0.18% and -0.03% respectively) indicate under allocation by the models. Conversely, the positive errors over 12 months in band 02 and bands 04 to 08 inclusive indicate over allocation by the models. Overall, consumption band winter period errors range from -0.35% to +2.30% and overall consumption band summer period errors range from -1.86% to +3.97%. Actual summer demands are lower and hence percentage errors can be somewhat greater in the summer. The levels of the winter and summer period errors suggest that for consumption band 01 the profile has under allocated in the winter and in the summer. For bands 03, 04 and 08 the profiles in 2016/17 were a little too peaky, while for consumption bands 02, 05, 06 and 07 the profiles were a little too flat. There are (of course) exceptions to this broad generalisation in some individual LDZs (see Figures S12.75 and S12.76).

The bar chart in Figure S12.83 (RETRO) shows that the algorithms derived for 2017/18 would (if applied to gas year 2016/17) have resulted in a similar outcome for the majority of consumption bands overall. Whole year errors are very small overall for all the consumption bands, but for this 'RETRO' case they range between -0.19% and +1.20%. Winter and summer period errors are slightly improved for bands 03, 04, 06 and 07. However, the winter and summer period errors are slightly worse for bands 01, 02, 05 and 08.

It must be borne in mind that both the 'MODEL' and 'RETRO' analyses are based on validated NDM sample data which is not necessarily representative of the population as a whole. Furthermore, this sample dataset suffers from small numbers of contributing meter/supply points at the higher consumption bands. It was observed that some winter and summer errors, on both 'MODEL' and 'RETRO' bases, for some LDZs looked unusually high when compared against errors in other LDZs in the same consumption band. WN LDZ for Band 02 with a winter error of -9.63% and a summer error of +36.74% appear to be a result of the analysis only being based on 3 supply meter points. Also, NT LDZ in Band 07, with a winter error of -18% and a summer error of +48.94%, is measured against 19 supply meter points, many of which appear to be weather sensitive. Where LDZ and bucket band analysis is performed using a relatively low count of supply meter points and where a large proportion of these are weather sensitive sites, we are likely to experience higher than expected errors, as seen in NT LDZ in Band 07.

A selection of monthly charts is also presented: Figures S12.84 to S12.91 are monthly bar charts comparing actual and allocated demands, across all LDZs for consumption bands 01 to 08 respectively. These show for each month, actual demand, and allocated demand on the 'MODEL' and 'RETRO' bases.

In interpreting these monthly charts it is relevant to recall the weather conditions that prevailed during gas year 2016/17.

Over the winter six month period, October 2016 was slightly colder than the current seasonal normal overall and ranked 23rd warmest over the past 50 years. The majority of days throughout the month were slightly colder than the current seasonal normal with the most notable exception being the last week of the month which was marginally warmer than normal. November 2016 was much colder than the current seasonal normal overall, ranking as the 13th coldest November over the past 50 years, with the majority of the individual days being colder than normal. December 2016 was warmer than the current seasonal normal overall, resulting in it being ranked the 4th warmest December in the last 50 years. With the exception of some days at the beginning and end of the month, most individual days were much warmer than normal. January 2017 was colder than the current season normal overall and ranked as the 22nd coldest January over the past 50 years. Most of the individual days throughout the month were slightly colder than the current seasonal normal with the most notable cold day being observed on 26th January 2017. February 2017 was warmer than the current seasonal normal and ranked as the 8th warmest February in the past 50 years. The majority of the individual days throughout the month were much warmer than normal, most notably the 3 day period from 20th to 22nd. March 2017 was much warmer than the current seasonal normal overall which resulted in it being ranked as the 2nd warmest March in the last 50 years with almost all the individual days being warmer than normal.

During the summer six month period, April 2017 was slightly warmer than the current seasonal normal overall and ranked as the 8th warmest April in in past 50 years. The warmer than normal weather from the previous month continued, with all days during the first half of April being warmer than normal. In contrast, the second half of April was mostly colder than normal, particularly the last week. May 2017 was marginally warmer than the current seasonal normal but ranked as the 5th warmest May in the past 50 years. The majority of the individual days throughout the month were much warmer than normal, most notably the 5 day period from 24th to 28th (the CWV reached its maximum value in 12 of the 13 LDZs on 26th May 2017). June 2017 was warmer than seasonal normal overall, ranking 5th warmest in the past 50 years, with the individual days throughout the month being predominantly slightly warmer than normal and over the period 18th to 22nd June 2017, the CWV reached its maximum value in at least 10 of the 13 LDZs. July 2017 was slightly colder than the current seasonal normal overall but ranked 16th warmest over the past 50 years. Each of the individual days throughout the month were very close to normal although the CWV reached its maximum in at least 10 of the 13 LDZs on 6th, 18th and 19th July 2017. August 2017 was colder than the current seasonal normal overall and ranked as the 23rd coldest August over the past 50 years with the majority of individual days throughout the month being very close to normal. September 2017 was colder than the current seasonal normal overall, ranking as the 19th coldest September in the last 50 years.

The monthly chart for band 01, in Figure S12.84, indicates winter under allocation in November 2016 (the 13th coldest November in 50 years), December 2016 and February 2017 but over allocation in October 2016, January 2017 and March 2017. During the summer months, over allocation was evident in April 2017 (the 8th warmest April in 50 years), July 2017 and August 2017 whilst summer under allocation was present in May 2017, June 2017 and September 2017.

Figure S12.80 shows the percentage errors over the full year (on the 'MODEL' basis) for band 01, by month (October 2016 to September 2017). Following evidence presented at the 15th February 2017 DESC meeting which reviewed the performance of the "01B" EUC models during the summer months, a decision was made to exclude holidays from the regression models for "01B" EUCs, which now brings them in line with the practice used for "02B" EUCs and above. This revised approach for 01B was first used in the development of algorithms for gas year 2017/18. Figure S12.81 shows the percentage errors over the full year for band 01 on the 'RETRO' basis. When comparing the band 01 errors from the 'MODEL' and 'RETRO' analysis, the individual months with the most notable improvements were April 2017 (11 out of 12 LDZs improved), November 2016 (10 out of 12 LDZs improved) and January 2017 (9 out of 12 LDZs improved). In contrast, months that saw errors deteriorate the most were October 2016 (11 of the 12 LDZs worsened) and December 2016 and May 2017 (10 out of 12 LDZs worsened).

The Unidentified Gas (UiG) analysis presented at the 21st November 2017 DESC meeting highlighted a few LDZs where negative UiG was more prominent during the summer period than in other LDZs. These were SO LDZ during June and July 2017 and EA LDZ during July and August 2017. The results of the monthly error analysis over the full year for band 01 (Figure S12.80 – MODEL basis) show that SO and EA LDZs were the only 2 of the 12 to show over allocation in each of the four summer months of June to September 2017. This apparent over allocation might explain some of the negative UiG values observed in these LDZs during the summer months listed.

The monthly chart for band 02, in Figure S12.85, indicates winter under allocation in November 2016, January 2017, February 2017 and March 2017 and summer over allocation in April 2017, July 2017, August 2017 and September 2017.

Figure S12.86 is the monthly chart for band 03, which shows small over allocation during the winter months of October 2016, December 2016, January 2017 and February 2017 but also shows mostly under allocation during the summer months, with the exception being in April 2017 and August 2017.

Figure S12.87 is the monthly chart for band 04, which shows mostly over allocation in the winter, the exception being in February 2017 and March 2017. Under allocation is prevalent during the summer months with the exception of April 2017 and September 2017.

The monthly charts for bands 05 to 08 are in Figures S12.88 to S12.91. Overall, bands 05, 06, 07 and 08 show a predominant small winter under allocation and a small summer over allocation (with exceptions for some months in some bands). For example, over allocation in bands 05 to 08 is evident for October 2016 and under allocation in bands 05 to 08 is evident for April 2017.

Finally, a selection of day of the week charts is also presented: Figures S12.92 to S12.99 are bar charts showing the day of the week error summary (on the 'MODEL' basis), by LDZ. For bands 01, 02 and 03 the analysis shows mostly under allocation during weekdays (i.e. Monday to Friday) and over allocation during weekend days (i.e. Saturday and Sunday). For bands 04, 05, 06 and 07 analysis shows a mixture of under and over allocation across all days, whilst band 08 displays mostly over allocation during weekdays and under allocation during weekend days.

Figure S12.65 – Validated Sample Site Breakdown

EUC	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW	ALL LDZs
01B	176	199	191	189	194	198	-	182	227	184	186	209	203	2,338
02B	115	103	133	101	140	113	3	66	157	148	177	140	114	1,510
03B	171	108	111	116	141	84	13	28	134	130	176	143	110	1,465
04B	298	223	212	323	191	189	23	56	186	224	319	268	97	2,609
05B	227	112	122	141	121	132	16	31	77	131	150	110	66	1,436
06B	90	57	74	71	70	78	7	24	42	51	42	46	48	700
07B	26	29	55	43	51	33	3	14	23	19	18	16	26	356
08B	10	10	38	22	35	38	4	10	17	15	7	10	14	230
Total	1,113	841	936	1,006	943	865	69	411	863	902	1,075	942	678	10,644

Figure S12.66 – Daily Actual and Deemed Demands for 01B (across all LDZs)

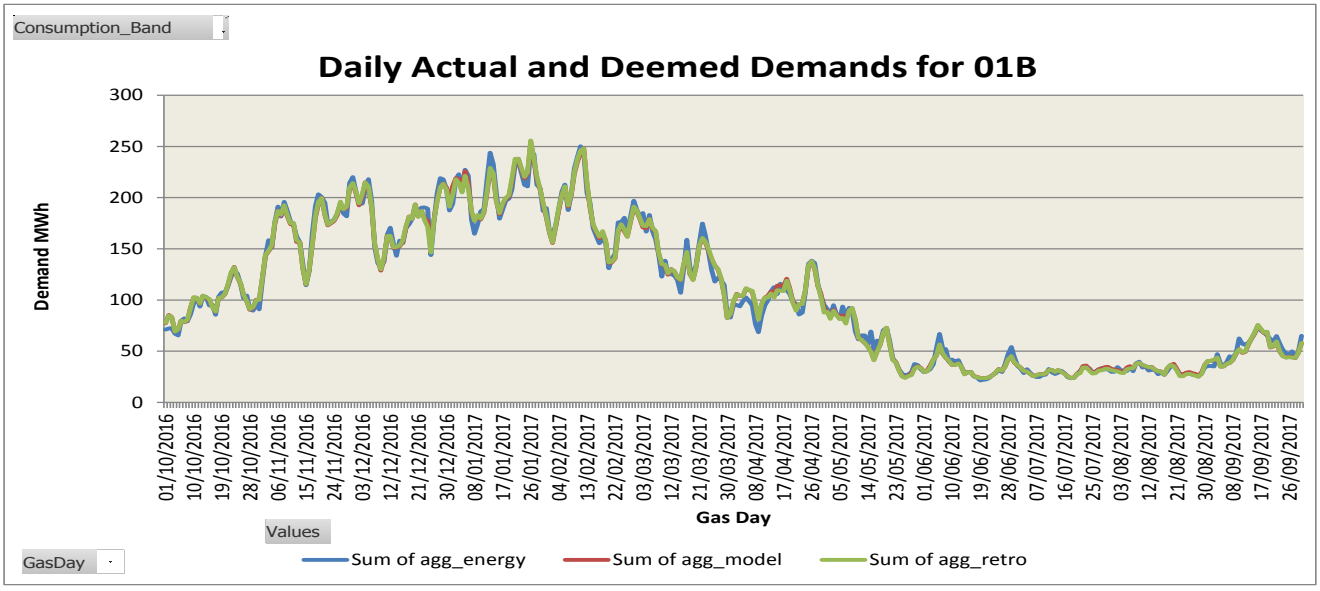

Figure S12.67 – Daily Actual and Deemed Demands for 02B (across all LDZs)

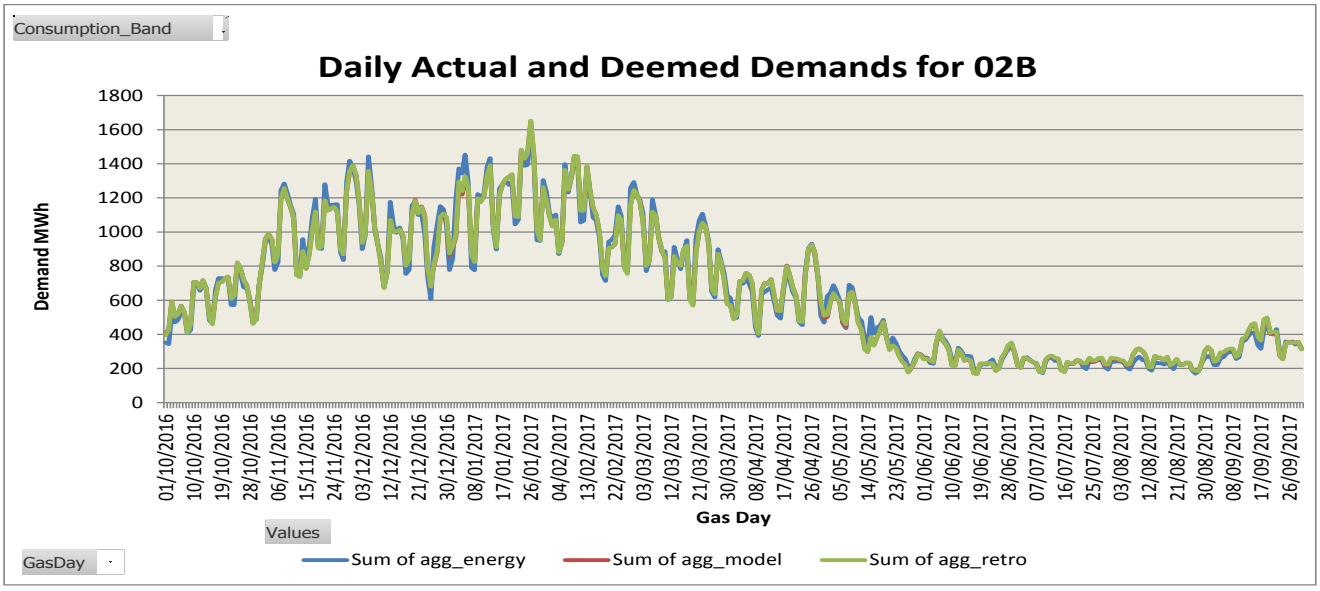

Figure S12.68 – Daily Actual and Deemed Demands for 03B (across all LDZs)

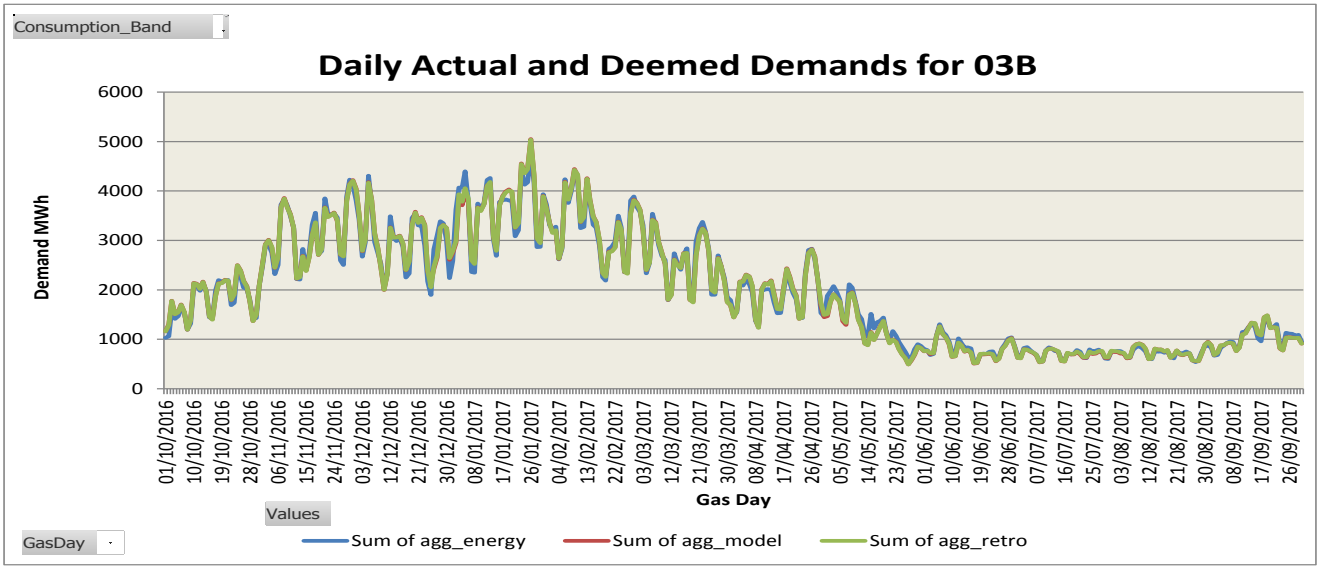

Figure S12.69 – Daily Actual and Deemed Demands for 04B (across all LDZs)

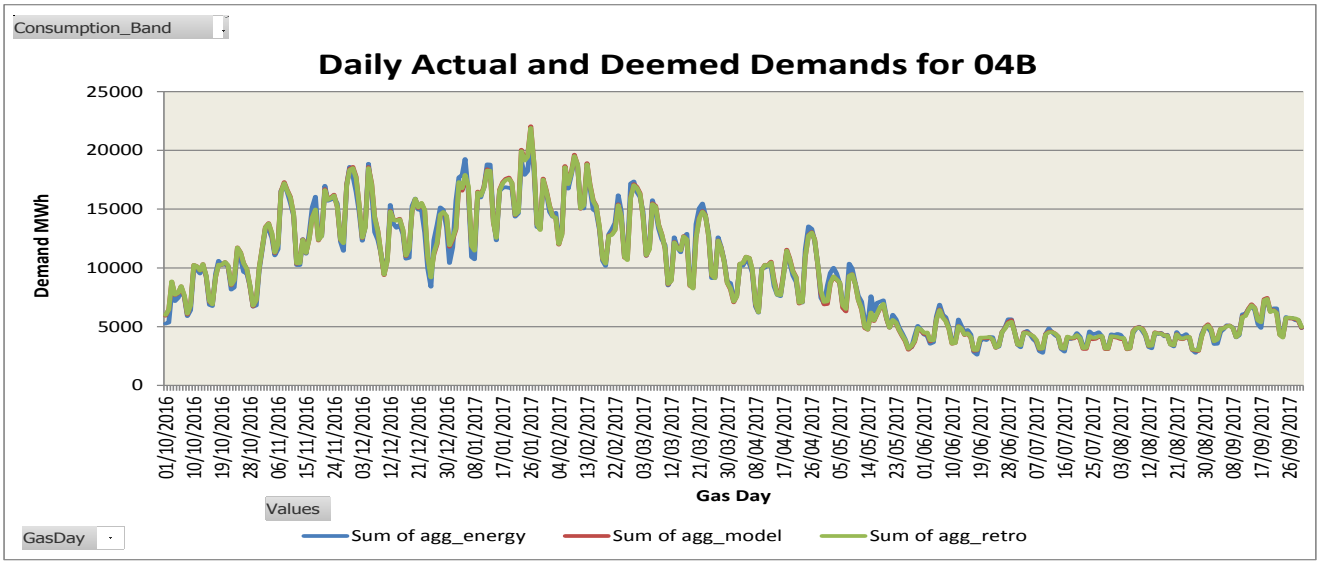

Figure S12.70 – Daily Actual and Deemed Demands for 05B (across all LDZs)

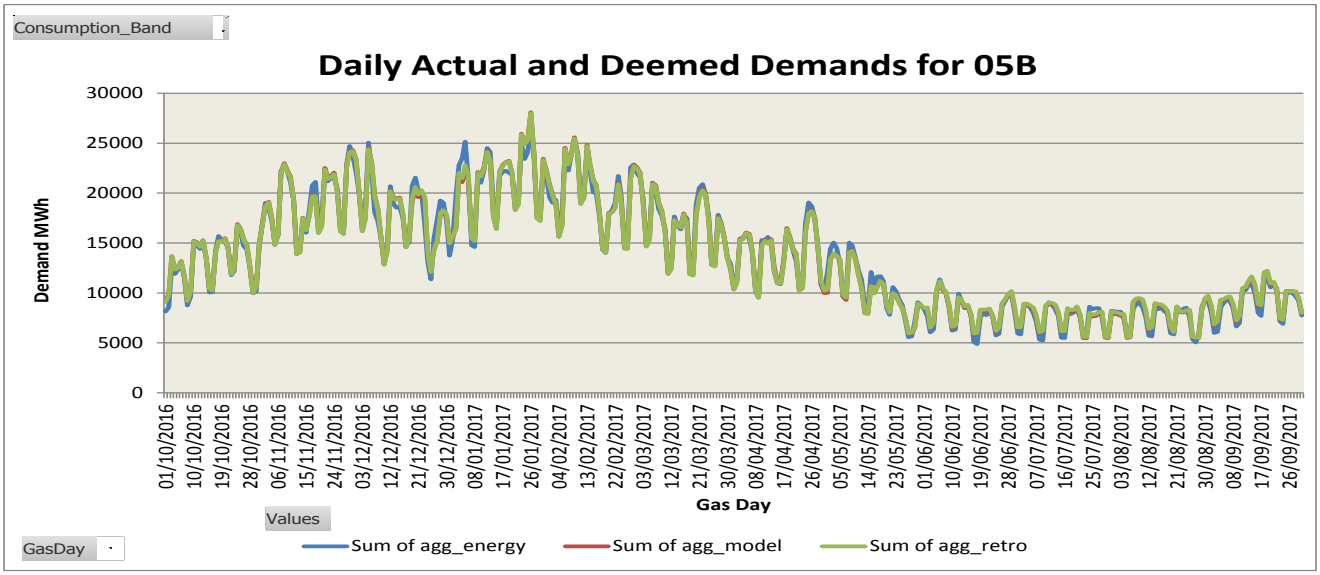

Figure S12.71 – Daily Actual and Deemed Demands for 06B (across all LDZs)

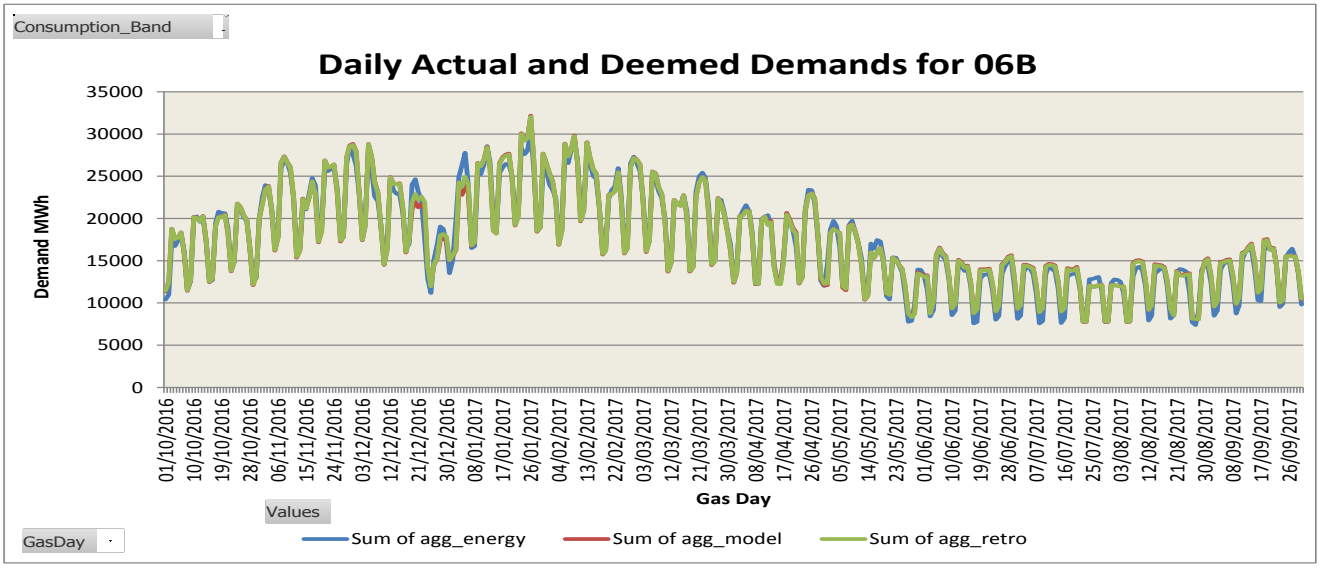

Figure S12.72 – Daily Actual and Deemed Demands for 07B (across all LDZs)

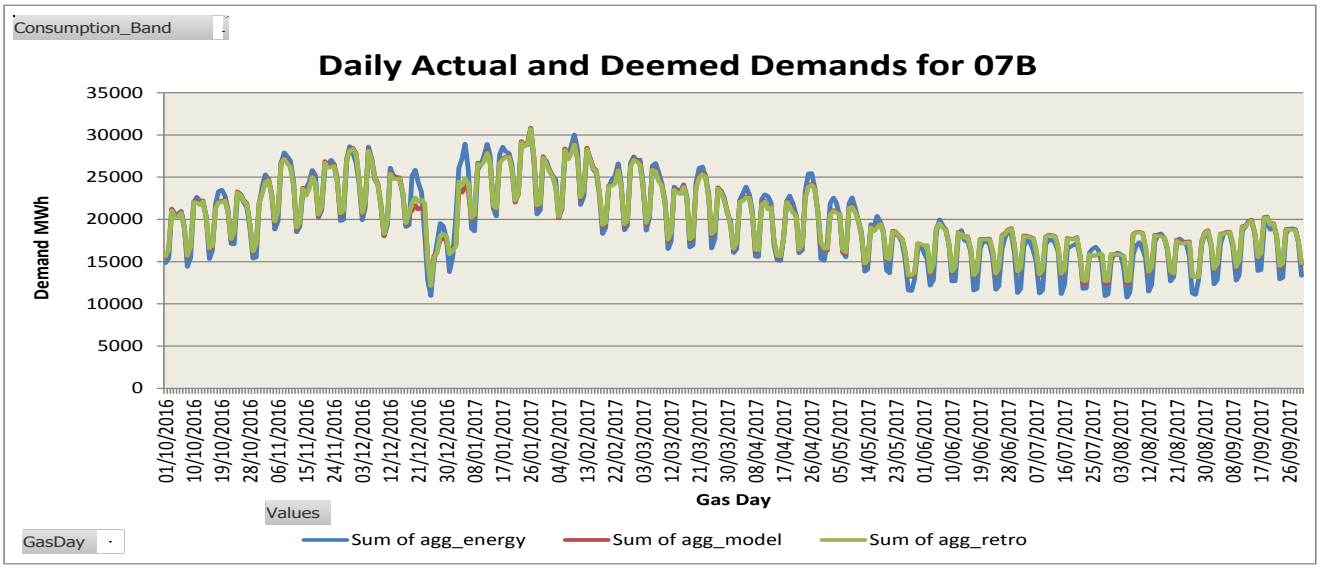

Figure S12.73 – Daily Actual and Deemed Demands for 08B (across all LDZs)

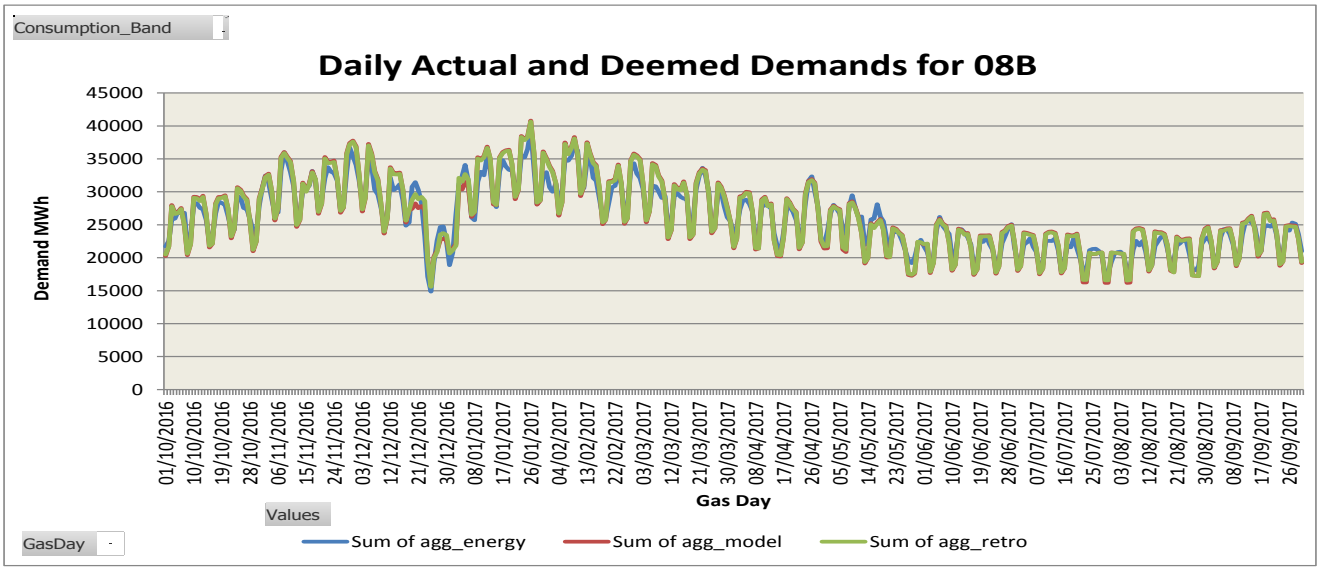

Figure S12.74 – Percentage Error over Full Year (Oct'16 to Sep'17) "MODEL Basis"

EUC	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW	ALL LDZs
01B	-0.16%	-0.52%	-0.08%	-0.17%	-0.28%	-0.23%	-	-0.05%	-0.10%	-0.21%	-0.18%	-0.09%	-0.07%	-0.18%
02B	0.08%	0.32%	0.05%	-0.04%	-0.13%	-0.08%	0.05%	-0.10%	-0.02%	0.17%	0.24%	0.07%	-0.04%	0.06%
03B	0.15%	-0.01%	0.07%	0.11%	-0.22%	-0.47%	0.07%	-0.39%	-0.01%	0.09%	0.10%	-0.15%	-0.16%	-0.03%
04B	0.20%	0.38%	0.11%	0.13%	0.48%	0.06%	0.11%	-0.13%	0.20%	0.31%	0.37%	0.22%	0.05%	0.23%
05B	0.35%	0.45%	0.02%	0.40%	0.73%	0.56%	0.02%	-0.08%	0.39%	0.40%	0.54%	0.52%	0.16%	0.40%
06B	0.75%	1.78%	0.37%	1.32%	1.34%	0.87%	0.37%	-0.01%	0.85%	0.61%	0.53%	0.63%	0.24%	0.84%
07B	0.93%	2.77%	0.45%	1.67%	1.89%	1.30%	0.45%	0.13%	1.08%	1.04%	0.66%	0.84%	0.40%	1.19%
08B	0.93%	2.77%	0.45%	1.67%	1.89%	1.30%	0.45%	0.13%	1.08%	1.04%	0.66%	0.84%	0.40%	1.13%

Figure S12.75 – Percentage Error over Winter (Oct'16 to Mar'17) "MODEL Basis"

EUC	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW	ALL LDZs
01B	-0.43%	0.09%	0.51%	-0.34%	-0.01%	-0.49%	-	0.80%	-0.45%	-0.40%	0.15%	-0.98%	-0.38%	-0.18%
02B	0.19%	-1.28%	-0.79%	-1.30%	-0.68%	-0.84%	-9.63%	2.62%	0.38%	1.85%	-1.04%	-0.44%	-1.97%	-0.38%
03B	0.15%	-0.21%	-1.85%	0.50%	0.15%	0.82%	-1.48%	-4.26%	1.02%	3.81%	0.82%	0.43%	3.60%	0.68%
04B	0.55%	1.97%	0.46%	3.46%	-0.19%	-0.86%	-3.02%	1.97%	1.71%	-1.13%	1.11%	0.74%	2.07%	0.92%
05B	0.18%	1.47%	0.13%	3.65%	-2.88%	-1.40%	-3.21%	-1.99%	-0.97%	0.50%	1.78%	0.36%	-0.03%	0.25%
06B	-0.59%	3.95%	-2.60%	4.30%	-0.68%	-0.82%	-2.39%	-3.69%	-3.18%	2.64%	1.66%	1.81%	-3.92%	-0.03%
07B	4.90%	8.59%	-1.23%	2.44%	-1.17%	-1.68%	4.24%	-1.20%	-4.95%	-18.00%	0.26%	8.66%	2.94%	-0.33%
08B	3.43%	5.14%	1.70%	3.01%	2.80%	2.46%	10.58%	-2.35%	3.83%	-0.05%	7.39%	-3.03%	1.12%	2.17%

Figure S12.76 – Percentage Error over Summer (Apr'17 to Sep'17) "MODEL Basis"

EUC	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW	ALL LDZs
01B	0.54%	-2.29%	-1.79%	0.31%	-1.12%	0.62%	-	-2.73%	1.03%	0.39%	-1.27%	2.82%	1.01%	-0.15%
02B	-0.17%	4.45%	2.21%	3.55%	1.57%	2.17%	36.74%	-7.68%	-1.14%	-3.73%	3.60%	1.52%	5.65%	1.23%
03B	0.15%	0.51%	5.22%	-0.87%	-1.23%	-4.18%	4.17%	14.99%	-2.91%	-8.32%	-1.81%	-1.86%	-10.72%	-1.92%
04B	-0.54%	-3.31%	-0.68%	-7.05%	2.06%	2.39%	8.21%	-5.21%	-3.42%	3.77%	-1.36%	-1.07%	-4.43%	-1.39%
05B	0.65%	-1.48%	-0.18%	-5.25%	7.92%	4.45%	6.15%	3.88%	3.24%	0.21%	-1.74%	0.84%	0.51%	0.69%
06B	2.80%	-1.32%	4.97%	-2.42%	4.44%	3.60%	4.62%	5.87%	7.55%	-2.76%	-1.43%	-1.56%	7.79%	2.19%
07B	-4.01%	-3.64%	2.68%	0.79%	5.88%	5.38%	-4.00%	1.98%	10.15%	48.94%	1.36%	-10.41%	-2.83%	3.24%
08B	-2.28%	-0.03%	-1.10%	0.15%	0.80%	-0.14%	-10.08%	3.68%	-2.29%	2.60%	-9.18%	8.37%	-0.56%	-0.20%

Figure S12.77 – Percentage Error over Full Year (Oct'16 to Sep'17) "RETRO Basis"

EUC	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW	ALL LDZs
01B	-0.15%	-0.53%	-0.07%	-0.24%	-0.34%	-0.24%	-	-0.03%	-0.11%	-0.23%	-0.19%	-0.10%	-0.08%	-0.19%
02B	0.14%	0.34%	0.04%	-0.04%	-0.14%	-0.07%	0.04%	-0.04%	0.00%	0.28%	0.24%	0.05%	-0.05%	0.07%
03B	0.16%	-0.24%	-0.33%	0.14%	-0.24%	-0.42%	-0.33%	-0.33%	0.00%	0.14%	0.16%	-0.13%	-0.09%	-0.06%
04B	-0.12%	0.51%	-0.14%	0.20%	0.50%	-0.05%	-0.14%	0.01%	0.25%	0.30%	0.38%	0.32%	0.08%	0.20%
05B	0.38%	0.62%	0.03%	0.49%	0.71%	0.58%	0.03%	-0.07%	0.42%	0.41%	0.47%	0.52%	0.17%	0.43%
06B	0.68%	1.77%	0.36%	1.37%	1.36%	0.86%	0.36%	0.02%	0.87%	0.66%	0.57%	0.81%	0.21%	0.85%
07B	0.97%	2.89%	0.45%	1.73%	1.83%	1.33%	0.45%	0.13%	1.10%	0.95%	0.64%	0.81%	0.40%	1.20%
08B	0.97%	2.89%	0.45%	1.73%	1.83%	1.33%	0.45%	0.13%	1.10%	0.95%	0.64%	0.81%	0.40%	1.13%

Figure S12.78 – Percentage Error over Winter (Oct'16 to Mar'17) "RETRO Basis"

EUC	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW	ALL LDZs
01B	-0.35%	0.33%	0.63%	-0.09%	0.31%	-0.39%	-	1.10%	-0.20%	0.32%	0.64%	-0.86%	-0.09%	0.08%
02B	-0.80%	-1.31%	-0.48%	-1.31%	-0.70%	-0.90%	-9.35%	2.62%	0.39%	0.11%	-0.64%	0.01%	-1.69%	-0.48%
03B	-0.06%	1.01%	-0.32%	0.21%	0.33%	0.00%	0.06%	-5.00%	1.08%	3.05%	0.27%	0.57%	2.08%	0.58%
04B	0.63%	1.26%	0.68%	2.88%	-0.43%	0.18%	-2.81%	0.90%	0.97%	-0.77%	1.14%	0.43%	1.18%	0.78%
05B	-0.43%	0.41%	0.06%	2.58%	-2.32%	-1.55%	-3.28%	-2.81%	-1.38%	0.37%	1.80%	0.47%	0.51%	-0.02%
06B	0.89%	4.27%	-2.02%	3.79%	-0.63%	-0.26%	-1.81%	-3.85%	-3.18%	1.95%	1.29%	0.40%	-1.99%	0.22%
07B	3.92%	7.83%	-0.94%	1.68%	-0.24%	-2.31%	4.54%	-1.69%	-5.15%	-16.06%	0.63%	9.08%	2.53%	-0.31%
08B	2.46%	4.40%	1.99%	2.24%	3.76%	1.80%	10.90%	-2.83%	3.62%	2.32%	7.78%	-2.65%	0.72%	2.26%

Figure S12.79 – Percentage Error over Summer (Apr'17 to Sep'17) "RETRO Basis"

EUC	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW	ALL LDZs
01B	0.38%	-3.03%	-2.12%	-0.69%	-2.40%	0.26%	-	-3.59%	0.17%	-2.00%	-2.95%	2.39%	-0.03%	-1.05%
02B	2.33%	4.60%	1.39%	3.57%	1.59%	2.38%	35.63%	-7.44%	-1.10%	0.68%	2.56%	0.16%	4.76%	1.57%
03B	0.66%	-3.41%	-0.34%	-0.04%	-1.85%	-1.61%	-1.33%	18.19%	-3.04%	-6.46%	-0.15%	-2.18%	-6.17%	-1.74%
04B	-1.73%	-1.23%	-2.00%	-5.57%	2.71%	-0.63%	6.77%	-2.15%	-1.46%	2.86%	-1.40%	0.03%	-2.36%	-1.16%
05B	1.85%	1.01%	-0.02%	-3.16%	6.74%	4.82%	6.33%	5.63%	4.17%	0.50%	-1.98%	0.60%	-0.44%	1.27%
06B	0.36%	-1.80%	4.06%	-1.68%	4.43%	2.67%	3.71%	6.20%	7.58%	-1.50%	-0.69%	1.56%	4.21%	1.84%
07B	-2.68%	-2.55%	2.30%	1.79%	4.53%	6.32%	-4.36%	2.68%	10.50%	43.73%	0.66%	-11.08%	-2.29%	3.23%
08B	-0.93%	1.10%	-1.47%	1.14%	-0.49%	0.75%	-10.41%	4.39%	-1.97%	-0.99%	-9.81%	7.56%	-0.01%	-0.30%

Figure S12.80 - Percentage Error over Full Year (Band 01B) "MODEL Basis"

Month	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
Oct	-1.84%	3.98%	3.32%	-0.26%	1.08%	5.67%	-	7.38%	2.54%	3.16%	2.13%	0.08%	1.80%
Nov	-1.04%	-0.86%	-0.09%	-4.62%	-1.23%	-1.10%	-	0.94%	-2.62%	-2.70%	-2.57%	-1.74%	-0.98%
Dec	-2.17%	-3.22%	0.08%	-0.28%	-0.31%	-1.51%	-	3.46%	-1.48%	0.37%	0.27%	-0.06%	1.05%
Jan	1.22%	-0.09%	2.55%	0.76%	0.61%	0.83%	-	1.76%	0.79%	-1.23%	-0.70%	-0.43%	-1.52%
Feb	0.81%	2.12%	-1.80%	-0.79%	-0.28%	-2.49%	-	-2.38%	-1.39%	-1.56%	0.62%	-2.29%	-0.96%
Mar	-0.15%	0.72%	-0.27%	3.77%	0.48%	-2.05%	-	-4.23%	0.74%	1.86%	2.94%	-1.25%	-0.54%
Apr	3.38%	0.78%	1.44%	6.44%	4.41%	5.15%	-	2.20%	-0.31%	9.48%	7.02%	7.46%	10.50%
May	-0.10%	-8.54%	-2.47%	4.04%	-4.12%	-1.55%	-	-4.99%	-10.29%	-4.03%	-8.32%	-5.05%	-2.83%
Jun	-0.95%	-12.07%	-13.50%	-9.04%	-3.41%	-6.01%	-	-8.14%	1.40%	-4.41%	1.34%	3.61%	-0.59%
Jul	-0.52%	1.50%	-2.59%	2.31%	5.47%	-0.29%	-	8.12%	11.73%	-1.23%	-2.19%	3.77%	1.17%
Aug	0.30%	9.74%	2.43%	8.17%	5.44%	1.22%	-	-3.20%	14.90%	4.43%	-4.12%	4.90%	-2.69%
Sep	-2.15%	-2.84%	-1.30%	-13.66%	-13.38%	-1.51%	-	-11.31%	4.28%	-8.44%	-7.15%	1.49%	-9.40%

Figure S12.81 - Percentage Error over Full Year (Band 01B) "RETRO Basis"

Month	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
Oct	-1.41%	4.48%	3.88%	-1.77%	1.38%	5.96%	-	7.84%	2.89%	3.54%	2.55%	0.44%	2.18%
Nov	-0.87%	-0.36%	0.20%	-3.94%	-0.67%	-0.78%	-	1.50%	-2.13%	-1.64%	-1.80%	-1.32%	-0.32%
Dec	-2.48%	-3.63%	-0.21%	-0.49%	-0.45%	-1.65%	-	3.45%	-1.52%	0.54%	0.31%	-0.40%	0.56%
Jan	1.14%	0.01%	2.32%	1.44%	0.80%	0.57%	-	1.68%	0.76%	-0.59%	-0.41%	-0.71%	-1.43%
Feb	0.95%	2.63%	-1.52%	0.15%	0.32%	-2.18%	-	-1.82%	-0.87%	-0.40%	1.48%	-1.85%	-0.27%
Mar	0.13%	1.21%	0.11%	3.89%	0.98%	-1.70%	-	-3.72%	1.20%	2.73%	3.64%	-0.82%	0.07%
Apr	2.22%	0.34%	0.12%	4.51%	3.31%	4.50%	-	1.46%	-1.11%	7.69%	5.31%	7.32%	9.61%
May	0.32%	-8.99%	-2.31%	-0.47%	-4.15%	-1.73%	-	-6.06%	-10.70%	-6.24%	-9.50%	-5.36%	-3.85%
Jun	0.06%	-11.98%	-12.53%	-7.29%	-3.77%	-6.04%	-	-9.16%	0.78%	-7.51%	-0.42%	3.59%	-1.60%
Jul	-0.62%	-0.90%	-2.95%	-0.45%	0.56%	-0.73%	-	6.51%	9.92%	-5.60%	-5.28%	2.43%	-0.59%
Aug	-1.18%	5.87%	0.80%	6.54%	1.33%	0.05%	-	-4.83%	12.01%	0.22%	-7.42%	2.82%	-4.64%
Sep	-1.09%	-2.36%	-0.30%	-9.74%	-13.78%	-1.24%	-	-11.23%	4.30%	-9.43%	-7.52%	1.76%	-9.69%

Figure S12.82 – Percentage Error Summary (Weighted average across LDZs) "MODEL Basis"

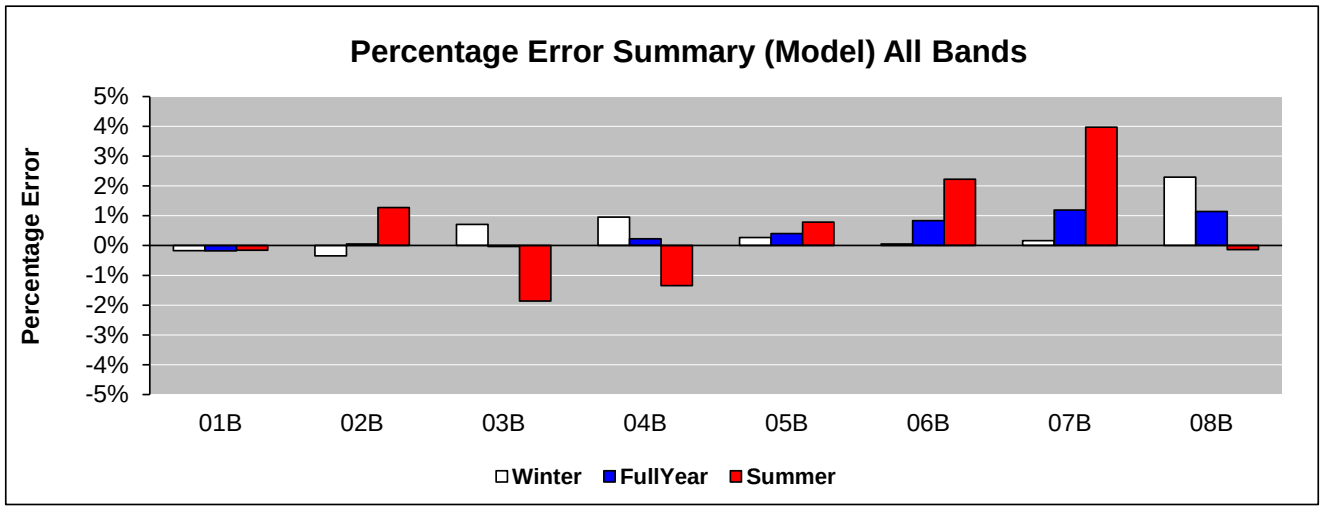

Figure S12.83 – Percentage Error Summary (Weighted average across LDZs) "RETRO Basis"

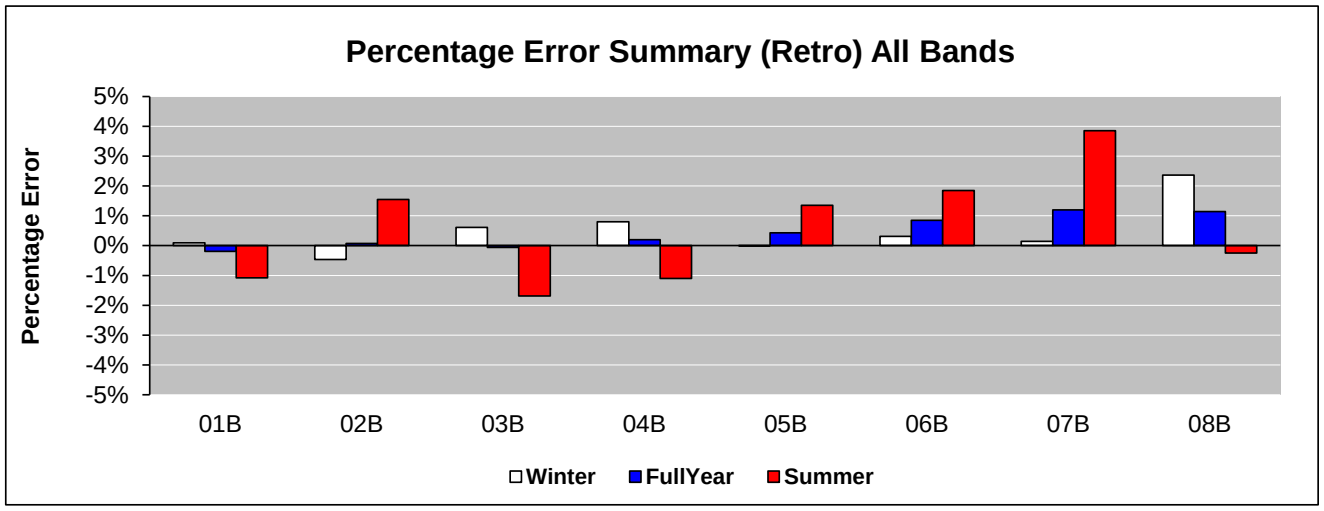

Figure S12.84 – Monthly Actual and Deemed Demands for 01B (across all LDZs)

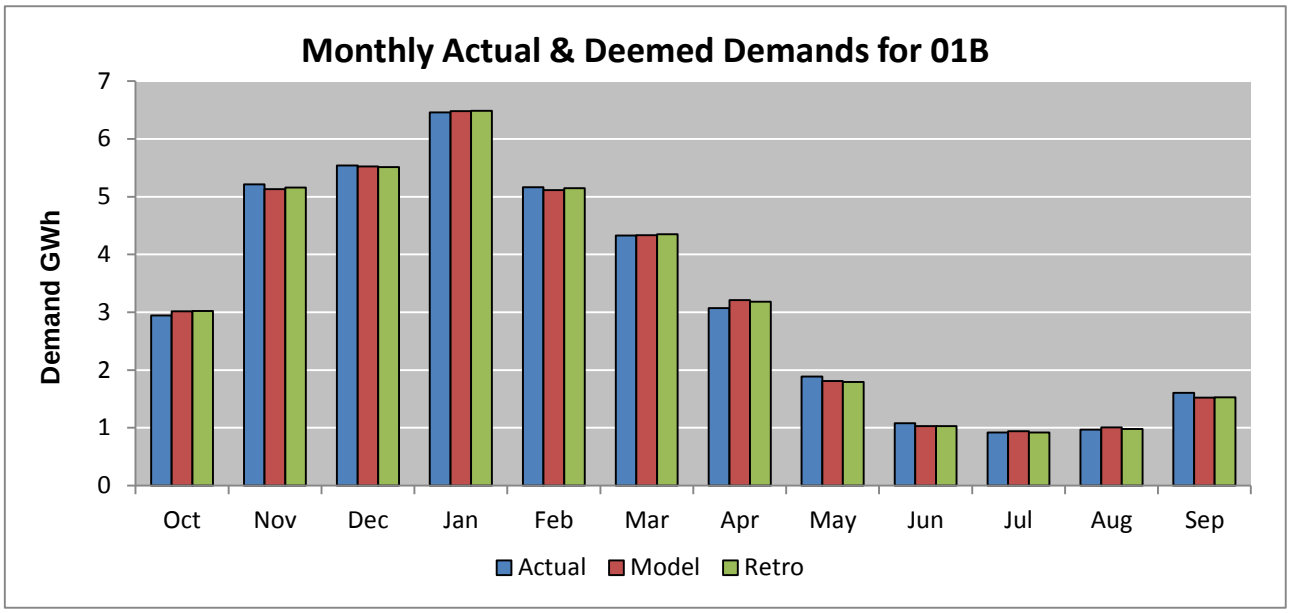

Figure S12.85 – Monthly Actual and Deemed Demands for 02B (across all LDZs)

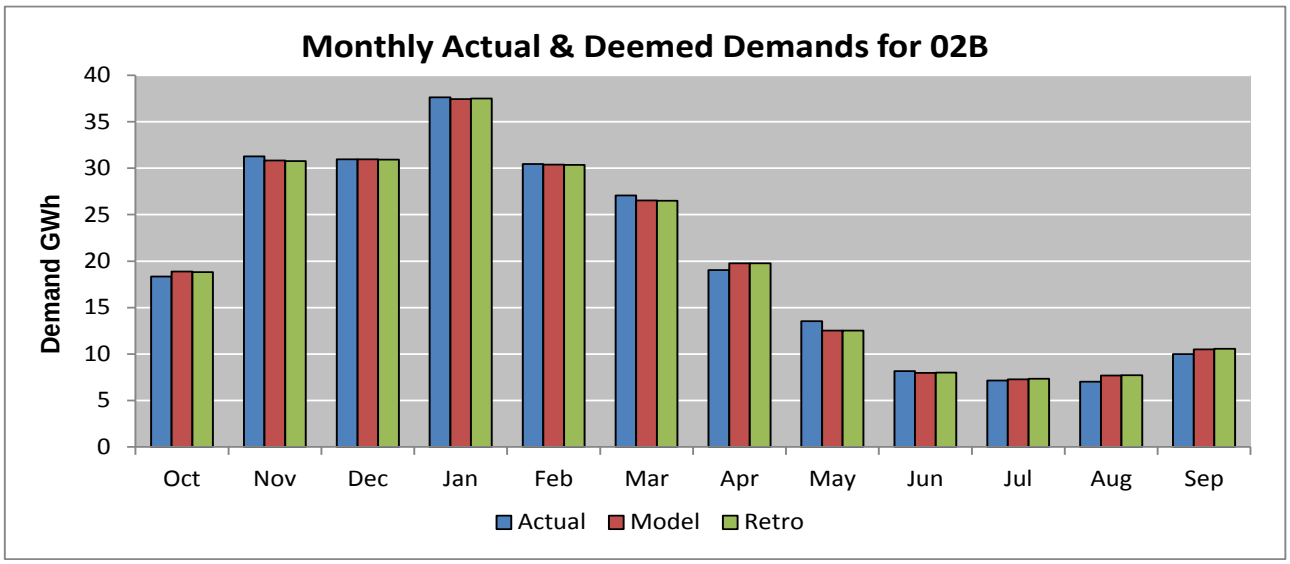

Figure S12.86 – Monthly Actual and Deemed Demands for 03B (across all LDZs)

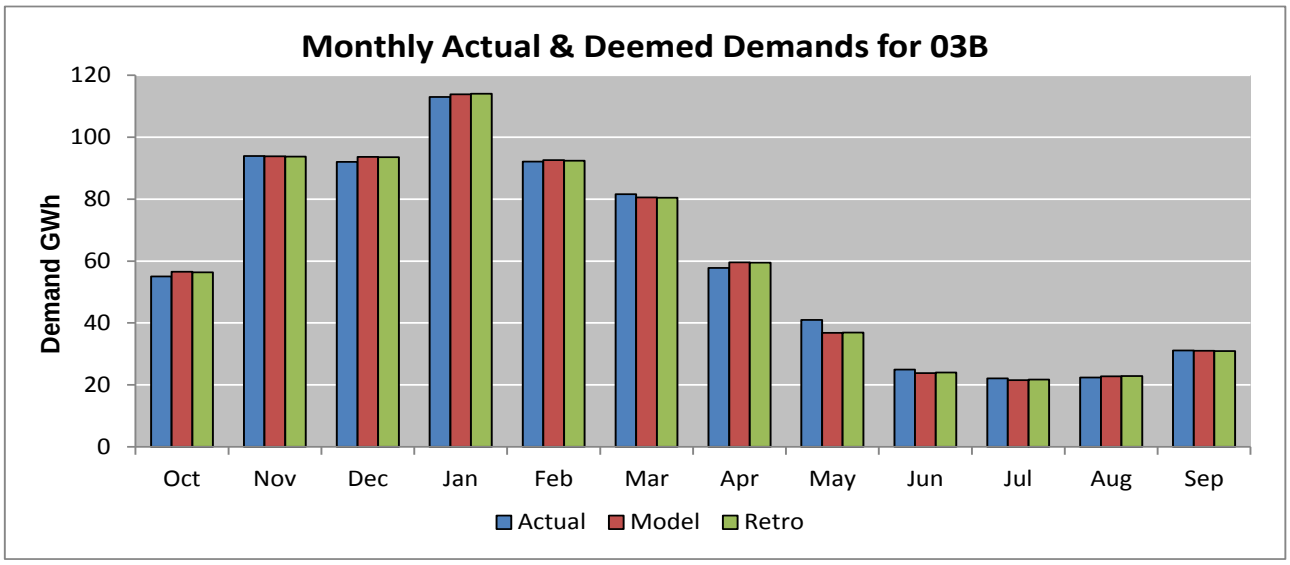

Figure S12.87 – Monthly Actual and Deemed Demands for 04B (across all LDZs)

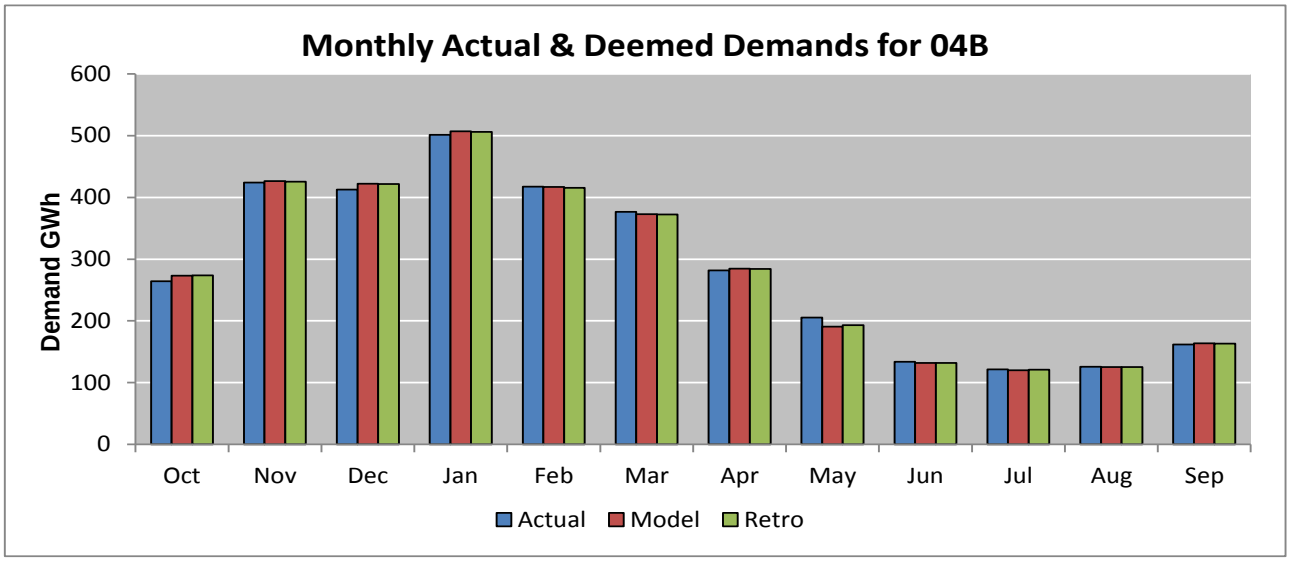

Figure S12.88– Monthly Actual and Deemed Demands for 05B (across all LDZs)

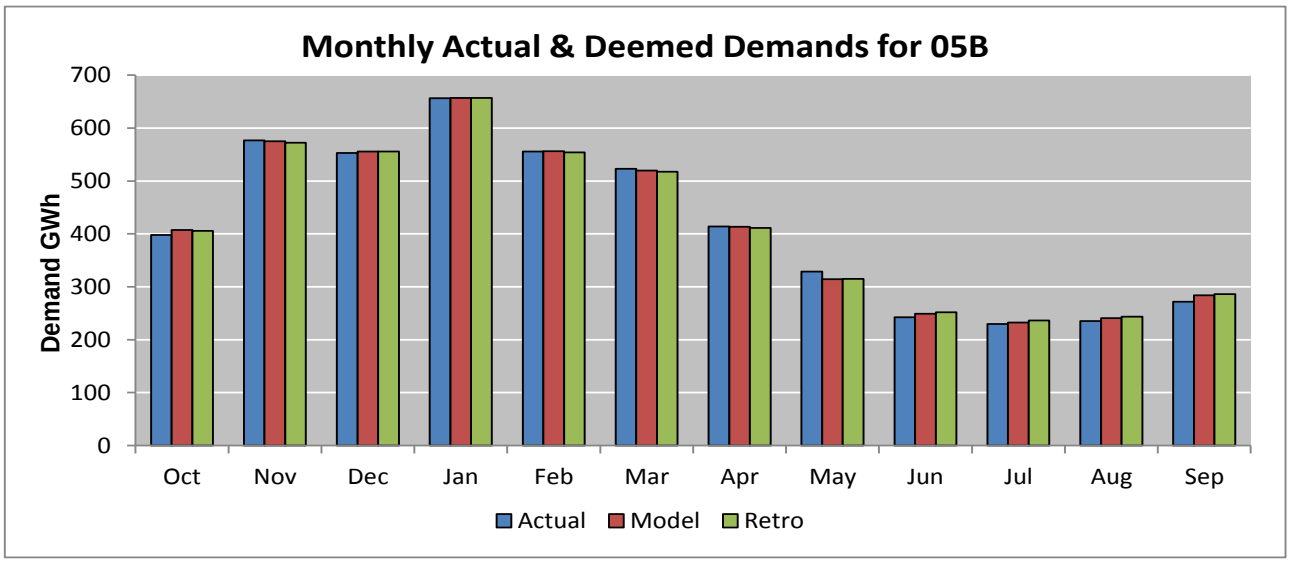

Figure S12.89 – Monthly Actual and Deemed Demands for 06B (across all LDZs)

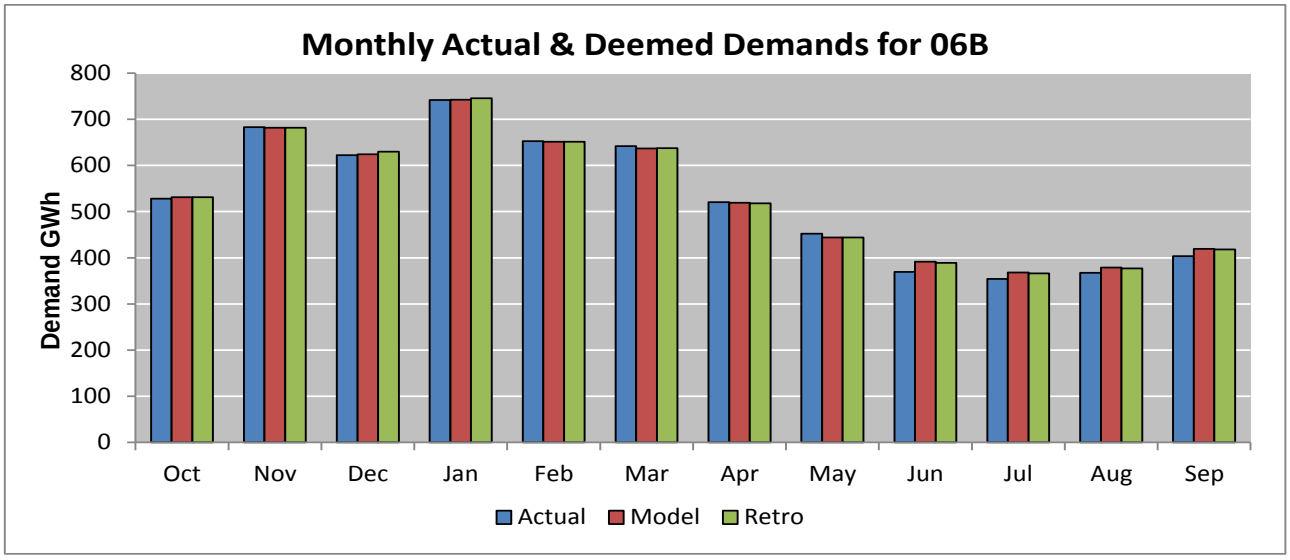

Figure S12.90 – Monthly Actual and Deemed Demands for 07B (across all LDZs)

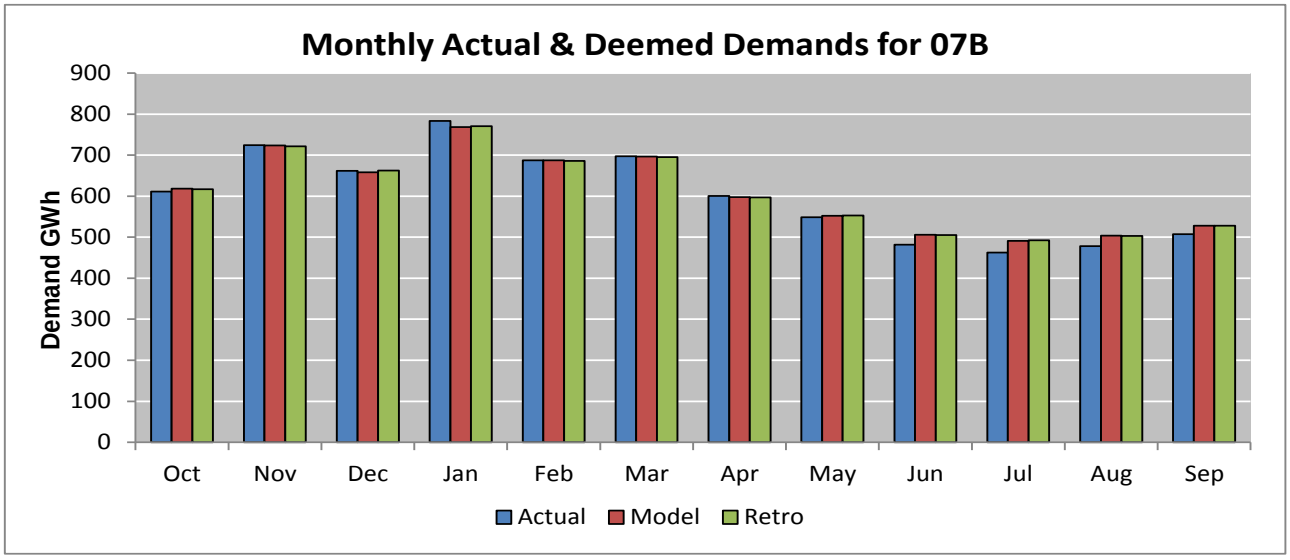

Figure S12.91 – Monthly Actual and Deemed Demands for 08B (across all LDZs)

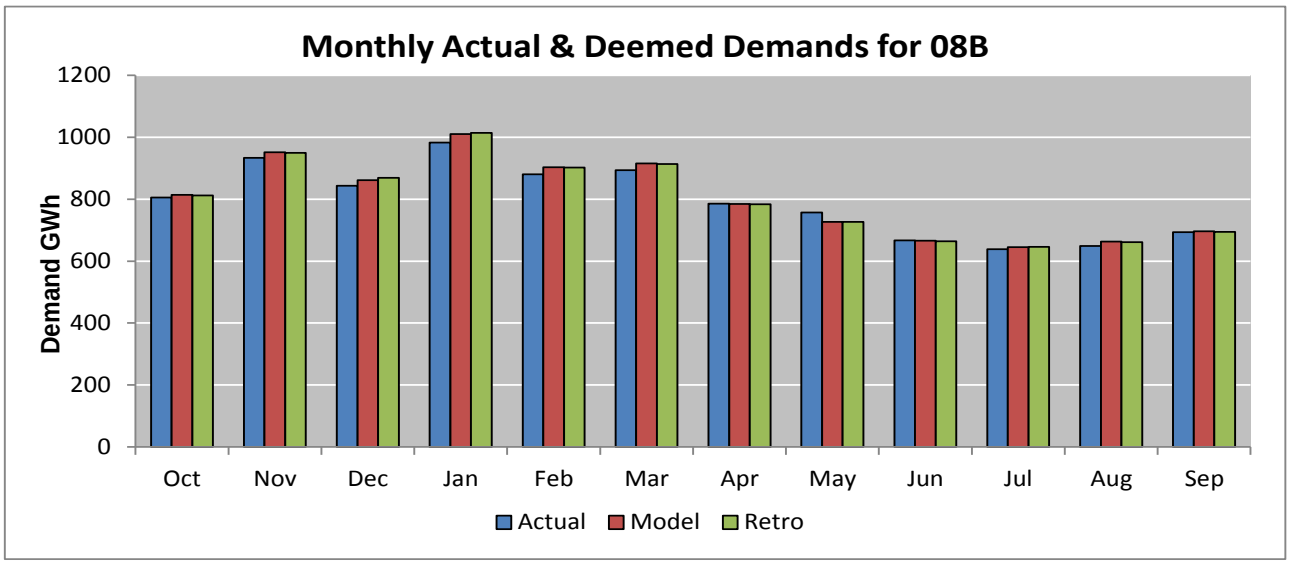

Figure S12.92 – Day of the Week Percentage Error Summary (Model) 01B

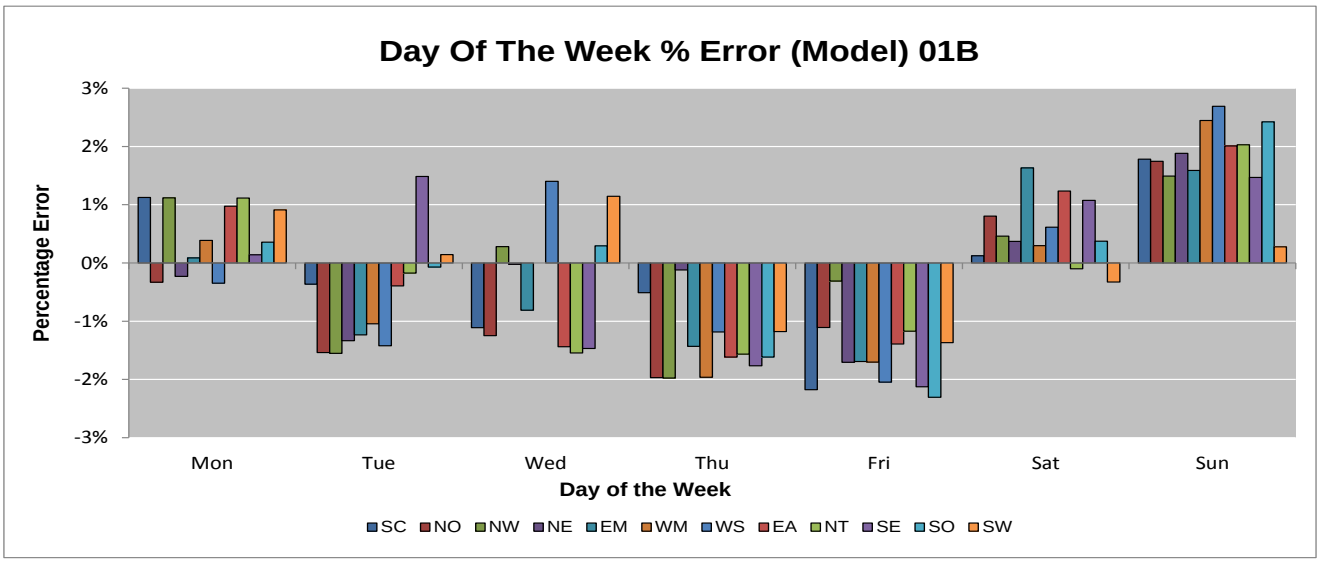

Figure S12.93 – Day of the Week Percentage Error Summary (Model) 02B

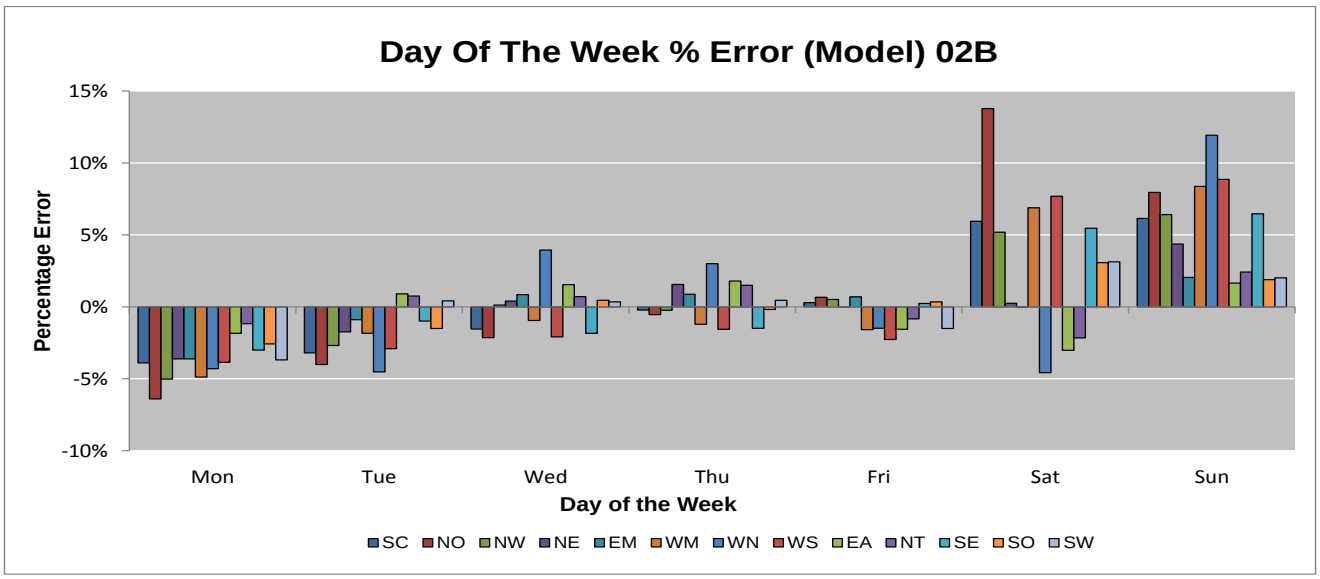

Figure S12.94 – Day of the Week Percentage Error Summary (Model) 03B

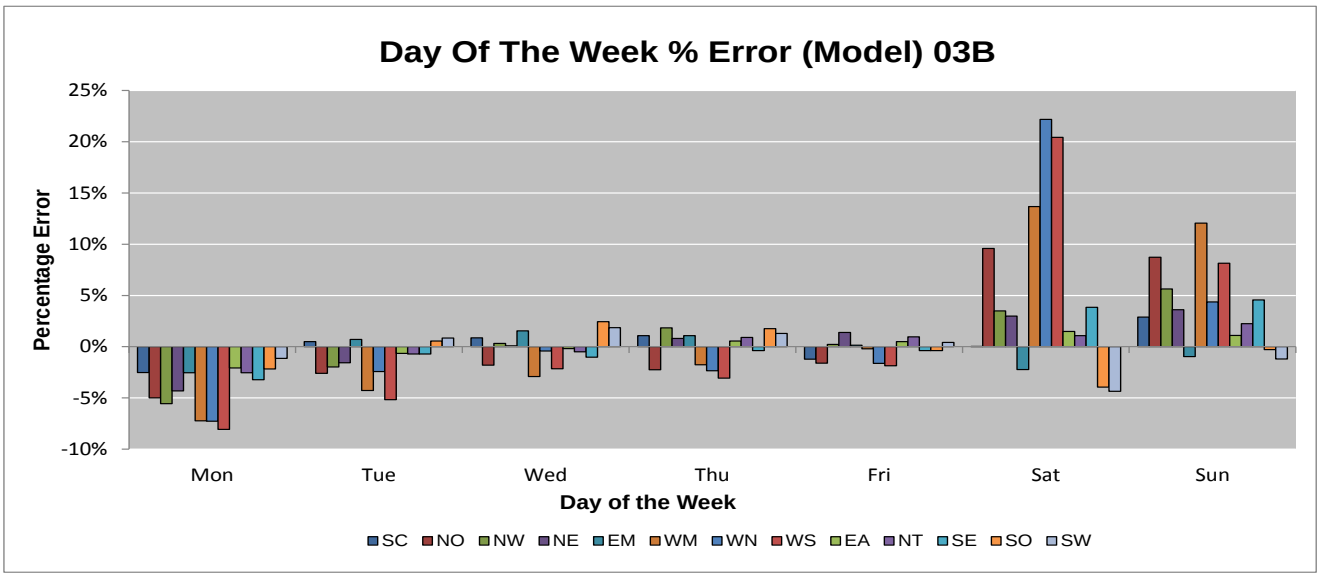

Figure S12.95 – Day of the Week Percentage Error Summary (Model) 04B

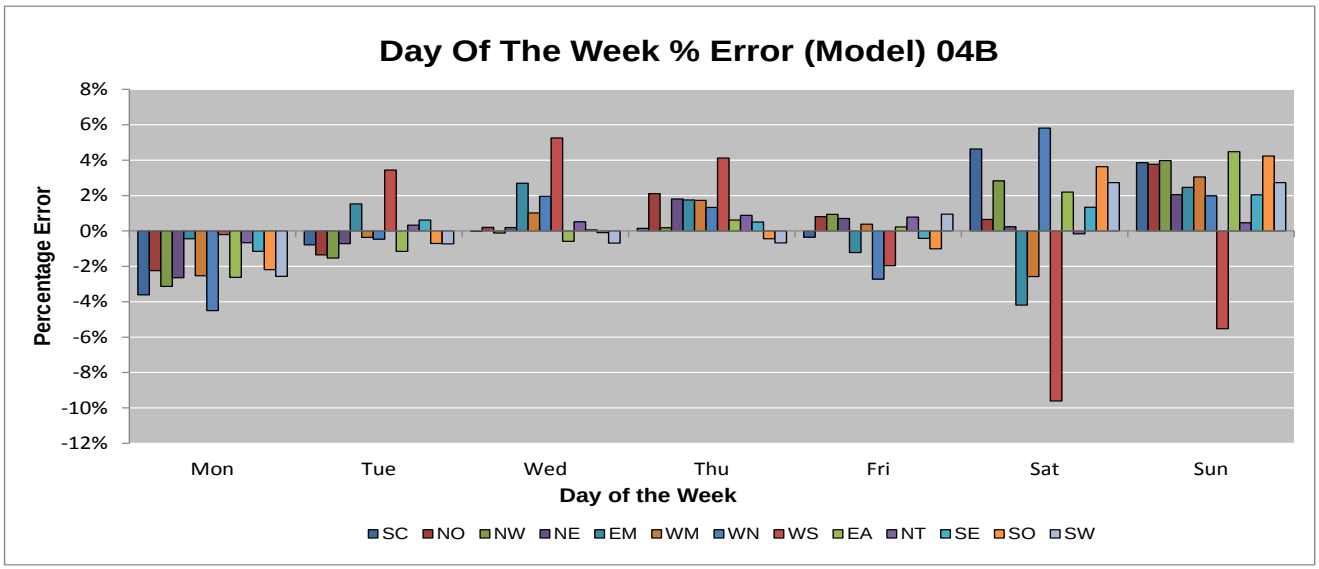

Figure S12.96 – Day of the Week Percentage Error Summary (Model) 05B

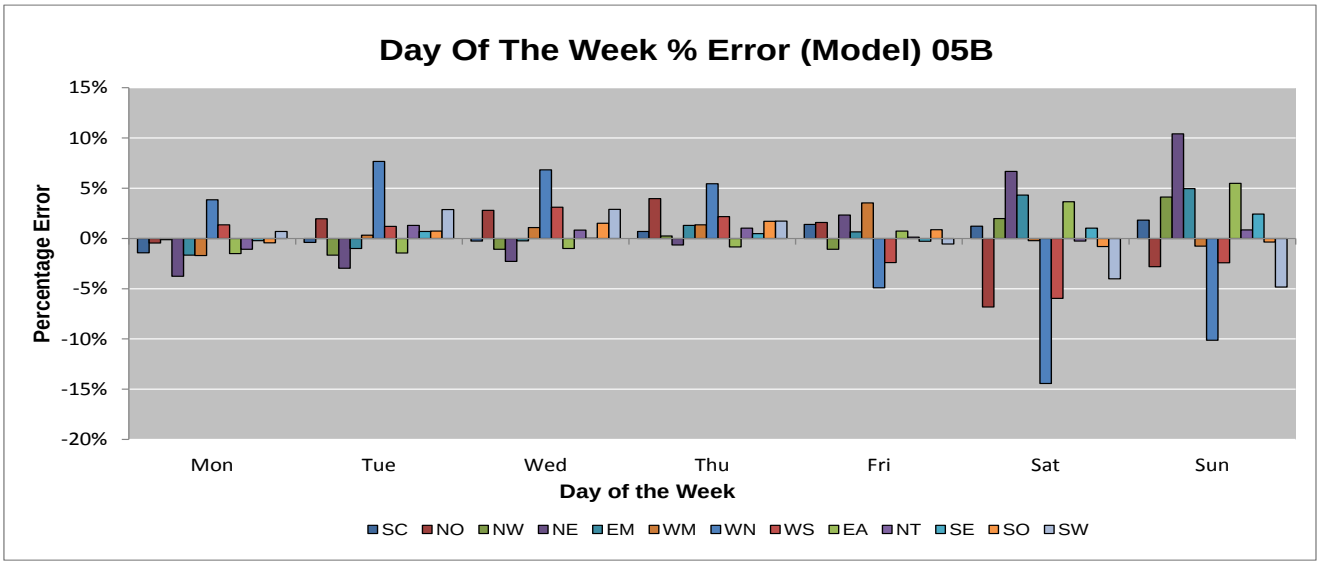

Figure S12.97 – Day of the Week Percentage Error Summary (Model) 06B

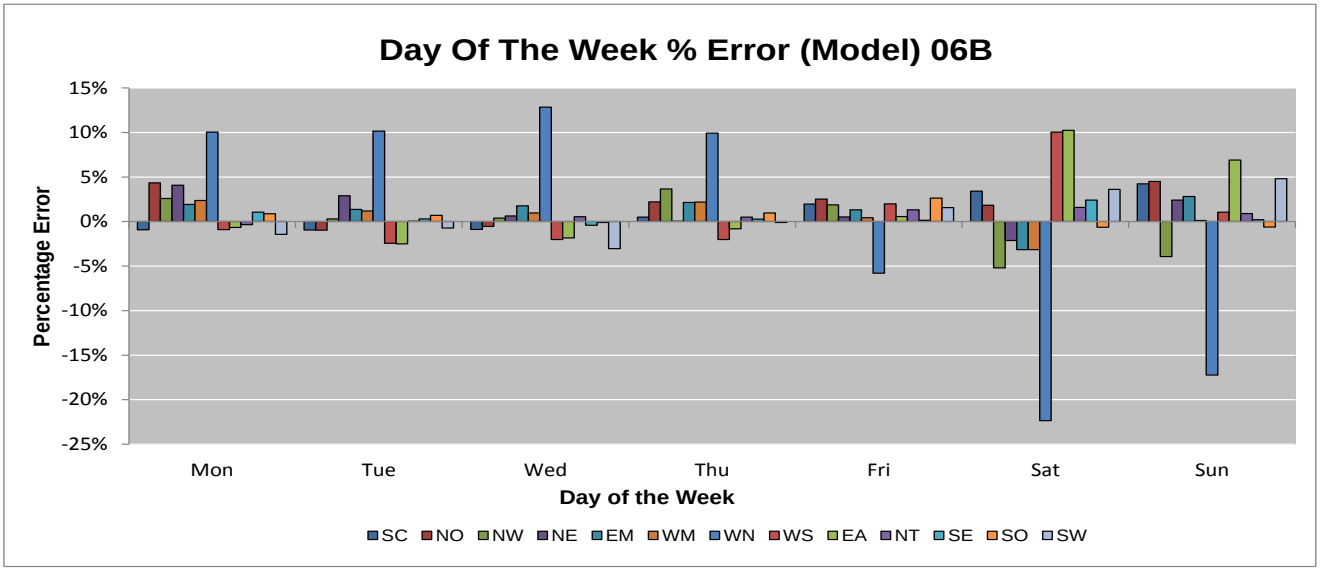

Figure S12.98 – Day of the Week Percentage Error Summary (Model) 07B

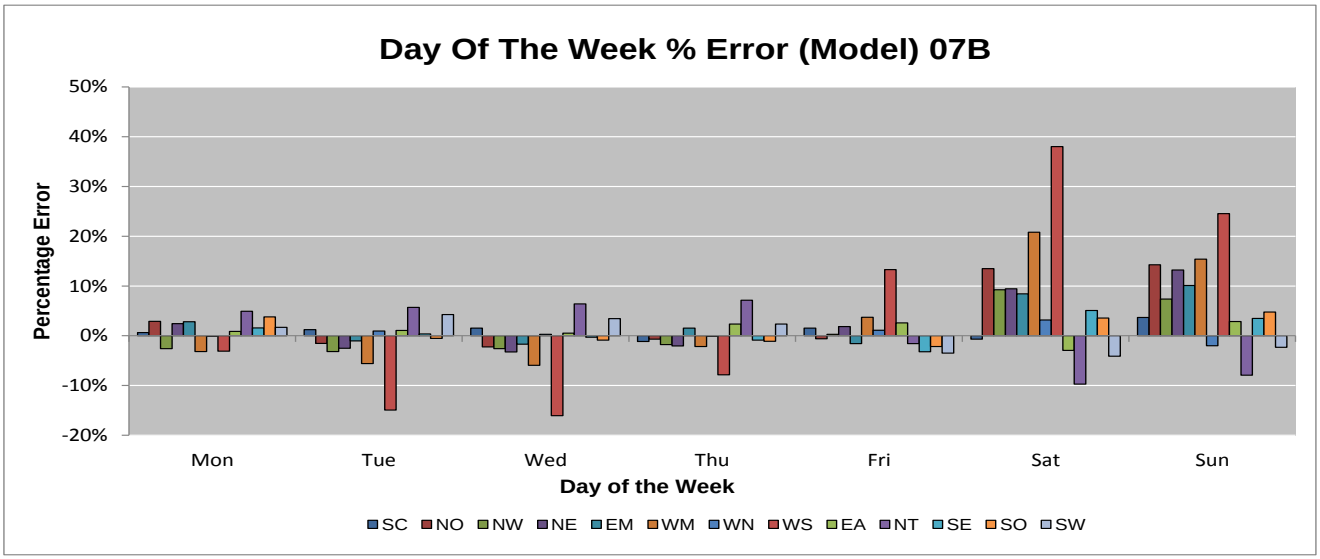

Figure S12.99 – Day of the Week Percentage Error Summary (Model) 08B