MODEL SMOOTHING – INVESTIGATIVE ANALYSIS

1.0 Background

The application of model smoothing was first undertaken in formulating the1999/00 NDM proposals. Model smoothing has since been applied to the NDM proposals for all subsequent years, including 2007/08.

It was agreed with the Demand Estimation Sub-Committee (DESC) and Ofgem that the method applied would be subject each year to examination by DESC and that the results of successive years of demand modelling (feeding into model smoothing) would be examined for evidence of trends (if any) so as to inform decisions on the approach to model smoothing in future years.

Investigations of model smoothing have been undertaken each autumn (since 1999 to 2005) and following discussion of those results at DESC, it was decided to continue to apply model smoothing in deriving the NDM proposals for the forthcoming year. In January 2006, DESC agreed to move to a biennial assessment of the continued applicability of model smoothing. This current note dated November 2007 is a full formal assessment along the lines last undertaken in September 2005.

2.0 Principles of Model Smoothing

Model smoothing was introduced due to EUC models exhibiting some year on year volatility, potentially being reflected in volatile ALPs, DAFs and Load Factors. It was therefore anticipated that averaging more than one year's models (historically 3 years) would achieve greater stability.

A further aspiration for the models is that of improved accuracy. However, the two objectives of stability and accuracy are not necessarily consistent. If there is an underlying change in customer behaviour which leads to changes in model characteristics then stability may be achieved at the expense of accuracy.

As in previous analysis, it is proposed here that accuracy is defined as the capability of a model (single year or smoothed) to predict the model that will be applied and fitted to the following year's actual data.

In order to attempt to illuminate this aspect it is possible to perform the following test on EUC models:

Compare the models of the actual 2006/07 consumption data with:

- *the 2005/06 models: 'Single Year Model' that would have been applied*
- *the smoothed models based on 03/04, 04/05 and 05/06 data: 'Smoothed Model' that was applied*

The test has been applied using two measurements:

- CWV intercepts - provide a simple indication of weather sensitivity - i.e. high CWV intercept implies low weather sensitivity. This allows an analysis of the difference between the Single and Smoothed model intercept 'prediction' and the actual intercept, i.e. how predictive the model type is.
- For each case, root mean square (RMS) values of the CWV intercept differences have also been computed to identify the level of variance between the Single, Smoothed and actual models, where applicable.

For this year's investigation of model smoothing the CWV intercepts from the analyses of the data sets for 03/04, 04/05 and 05/06 along with those for 2006/07, provide the necessary information.

Note that three new CWV definitions (implemented for the spring 2007 NDM analysis and effective from 1st October 2007) apply to EA, NT and SE LDZs respectively. For EUCs in these three LDZs, the values of CWV intercepts presented here pertain to this new definition of CWV. For EUCs in WS LDZ, the values of CWV intercepts presented here pertain to the definition of CWV that came in to effect on 1st October 2006. The values of CWV intercepts in respect of EUCs in all other LDZs pertain to the revised definitions of all those CWVs which were implemented from 1st October 2005. In general, for EUCs in LDZs where a CWV definition has changed, the CWV intercepts now presented here are not directly comparable with CWV intercepts published prior to the change of CWV definition.

3.0 Analysis

3.1 Consumption Band Analysis (Figures 1 & 2)

The charts attached as Figures 1 and 2 show, for the small and large NDM consumption band EUCs only, the difference between the respective CWV intercepts. For the small NDM consumption band EUCs (Figure 1) the chart for the smoothed model for 06/07 shows a small improvement, in terms of a smaller difference between the smoothed model and actual CWV intercepts, over that for the single year model for 06/07. This is also reflected in the respective RMS values which are lower for the smoothed model indicating less variance from the actual compared to the single year model. A similar outcome is shown for large NDM consumption band EUCs (Figure 2). So, for both small and large NDM consumption band EUCs, the smoothed model is better at predicting 06/07 than the single year model.

3.2 WAR Band Analysis (Figures 3 & 4)

This analysis has also been extended to include WAR band EUCs, the results from which are shown in Figures 3 and 4. The observed spread of CWV intercept differences from the actual for all small NDM EUCs (Figure 3) is narrower for the smoothed year model than for the single year model, but the RMS values (which indicate the spread of CWV intercept differences around zero) are the same in both cases.

For all large NDM EUCs including WAR band EUCs (Figure 4), the single year model is marginally better at predicting 06/07 than the smoothed model. The relevant RMS values (both including and excluding EUC09B) also reflect a better single year model than smoothed year.

This analysis has yielded similar results to those of previous years. There are signs of a small improvement in “predictive ability” with the smoothed model for small and large NDM consumption band EUCs. WAR band EUCs do not appear to follow this behaviour and tend to show a more predictive ability based on the single year model rather than the smoothed model. This is not surprising, given that the applicable winter annual ratio value for a supply point is based on the most recent winter only.

Overall these comparisons provide only some and not necessarily strong evidence as to the greater predictive capability of smoothed models. However, the main driver for using a smoothed model, determined and agreed by DESC, has historically been to mitigate year on year volatility rather than focusing on predictive capability.

3.3 Year on Year Volatility Analysis (Figures 5, 6, 7 & 8)

To attempt to identify a more definitive conclusion, a similar test has been applied to observe the year-on-year volatility of smoothed models as against individual years’ models. The charts in Figures 5 & 7 (small NDM) and Figures 6 & 8 (large NDM) show:

- Difference in CWV intercepts between the smoothed models applicable to gas year 06/07 (based on 03/04, 04/05 and 05/06) and the smoothed models applicable to gas year 2007/08 (based on 04/05, 05/06 and 06/07)
- Difference in CWV intercepts between individual year models for 05/06 and 06/07 that would have been applied to gas years 06/07 and 07/08 respectively if model smoothing had not been implemented.

The results in Figures 5 and 6 relate to both consumption band and WAR band EUCs, while the results in Figures 7 and 8 relate to just the consumption band EUCs. As expected, the smoothed models are associated with lower year-on-year volatility as shown by both the generally narrower distribution of CWV intercept differences and reductions in the corresponding RMS values. The reduced volatility with the smoothed models is more marked for the consumption band EUCs than for all EUCs (including WAR bands, this is so for both small NDM and large NDM).

4.0 Model Smoothing – Average or Trend (Figure 9, Table 1, 2 & 3)

On each occasion when this investigation of model smoothing has been carried out, there has been some discussion as to whether model averaging or model extrapolation is more appropriate. Extrapolation, i.e. no model smoothing, would only be worthy of consideration if a clear trend emerging over recent years could be detected. There has also been some discussion in previous years about the basis of this 'trend', i.e. whether a trend based on a limited number of years' data should be regarded as a reliable basis for extrapolation.

An analysis of CWV intercepts (all of which are on the revised weather basis) is attached which attempts to shed some light on whether trends exist. This analysis was last presented to DESC two years ago in autumn 2005. Therefore, for a complete view of CWV intercepts from one year to another the summary results of this CWV intercept analysis that would have applied in 2006 is also included (using the CWV intercepts that would have been applicable to the spring 2006 NDM analysis).

The CWV intercept analysis has been applied to all EUCs, small and large NDM, including both consumption and WAR band EUCs, The analysis compares the change in CWV intercept values between each year to highlight any trends. The Table 1 Key shows the classification scheme that has been applied to the individual years comprising the smoothed models for gas year 2007/08 (04/05, 05/06, 06/07) and the change in intercept value between these years. Essentially there are 5 possible patterns for a series of 3 CWV intercepts to follow:

- UP/ UP (UU)
- DOWN / UP (DU)
- FLAT (F)
- UP / DOWN (UD)
- DOWN / DOWN (DD)

The character code associated with each of the patterns is shown above in (x), and Table 1 shows how each EUC is classified. In Table 2, the counts of each type are shown, firstly a count by EUC across the LDZs, and secondly a count by LDZ across the EUCs.

For the analysis years 04/05, 05/06 and 06/07, the overall count of the different pattern types indicates that:

- The most frequently observed pattern is "up/down", with 195 occurrences out of 429 (there were 169 in 2006 and 111 in 2005).
- The "down/up" pattern shows 68 occurrences (there were 65 in 2006 and 151 in 2005).
- Thus, taken together, 263 occurrences (234 in 2006 and 262 in 2005) have no increasing or decreasing pattern over the three years.
- This year also shows 39 flat models (38 in 2006 and 35 in 2005).

As has been the case in all previous years, this year too the occurrences of a consistent pattern / potential trend (i.e. "up/up" or "down/down") are not materially greater in each instance than might be expected simply on a random basis. The numbers of occurrences of the "up/up" pattern is just 28, notably lower than in the previous two years. The numbers of occurrences of the "down/down" pattern is 99, somewhat higher than in the previous two years. However, this level of occurrences is not particularly significant - for example the same pattern occurred at a similar level in the 2003 analysis and the "up/up" pattern has occurred at similar levels in both 2005 and 2006.

Over the three years, there are some instances of specific EUCs and specific LDZs, where a "down/down" pattern or an "up/up" pattern occurs to a notable extent. In any event, three data points may not necessarily point to a trend and examination of a fourth year of CWV intercept data reveals that these possible instances are not sustained.

For the four most recent analysis years (the additional 03/04 and 04/05, 05/06 and 06/07) CWV intercepts are available on a consistent basis. These may be categorised into four groups, namely: no consistent trend, increasing trend, decreasing trend and flat models. Summary results are presented as Table 3.

These show that 353 out of 429 occurrences (there were 355 in 2006 and 360 in 2005) indicate no consistent trend while the numbers of consistently decreasing or consistently increasing occurrences are now very small (19 and 19 respectively).

The count of EUCs of no consistent pattern (353) is very similar to that of previous years. As Table 3 shows, the results for all previous model smoothing investigations have been very similar. The vast majority of cases are always that of no consistent trend. Furthermore, in all these investigations, the occurrences of consistent trends have been very much smaller than might be expected on purely random grounds.

The apparently concentrated occurrences: of a downward pattern in CWV intercepts over three years (e.g. EA, NT, SE, SO and SW LDZs) and of an upward pattern in CWV intercepts over three years (e.g. SC, NW, WN LDZs), are all not borne out over the four year analysis. For every LDZ over four years, the predominant effect is of no consistent pattern.

For all the EUCs which showed a majority of occurrences (7 or more out of 13) of a downward pattern in CWV intercepts over three years (namely: xx:E0703W01, xx:E0704W01 and xx:E0705W04) the four year picture is one of no consistent trend in all except 1 or 2 LDZs for each of these EUCs.

Only one EUC showed a majority of occurrences (in this case 12 out of 13) of an upward pattern in CWV intercepts over three years (namely: xx:E0707W02). Over four years as well the same 12 out of 13 LDZs show an upward pattern in CWV intercepts. Only this single EUC out of 33 distinct EUCs in each LDZ shows this four year upward trend in CWV intercepts.

Moreover, a graph of load factors over each of four years for this EUC (xx:E0707W02) is presented in Figure 19. Despite the upward CWV intercept trend in 12 of 13 cases over the four years, load factors increase year on year in only 6 of 13 cases. So, in this EUC, itself a very minor constituent of total NDM load, indications of a trend are actually somewhat mixed.

4.0 Load Factor Trends (Figure 10 to 18)

The final set of information to be considered as part of this analysis is presented in Figures 10 to 18. These show the load factors for the Single Year models (that would have been applied) of the consumption band EUCs, over the four years available on a consistent basis.

These graphs of load factors (Figures 10 to 18) confirm the evidence of the CWV intercept information previously presented: there are no instances of a year on year increase or decrease in load factors in any of the consumption band EUCs in any of the LDZs.

5.0 Conclusion

It is the view of Transporters, on the basis of this material, supported also by the results of this same analysis undertaken in 2005 and in previous years, that there are no signs of trends in the EUC demand models of sufficient clarity to influence the manner in which model smoothing is applied. The basis of model smoothing has primarily been to remove year-on-year volatility and to remove the impact of modelling annual trends rather than predicted trends.

Consequently Transporters believe that the current averaging approach to model smoothing applied over three years continues to be appropriate and fit for purpose and is recommended to be applied for the 2008/09 analysis.

FIGURE 1: SMALL NDM (< 2,196,000) CONSUMPTION BAND EUCs PREDICTIVE ABILITY: Actual Consumption Model Intercept - Single or Smoothed Year Model Intercept

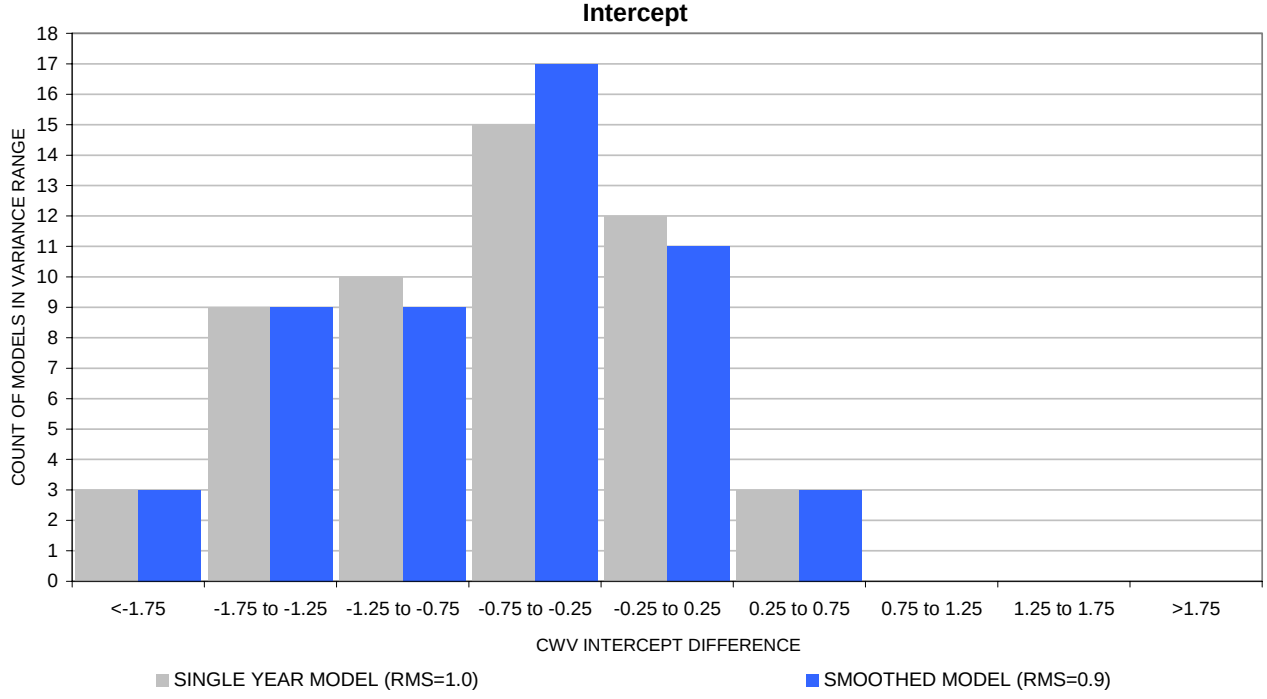

FIGURE 2: LARGE NDM (>2,196,000)CONSUMPTION BAND EUCs PREDICTIVE ABILITY:
Actual Consumption Model Intercept - Single or Smoothed Year Model Intercept

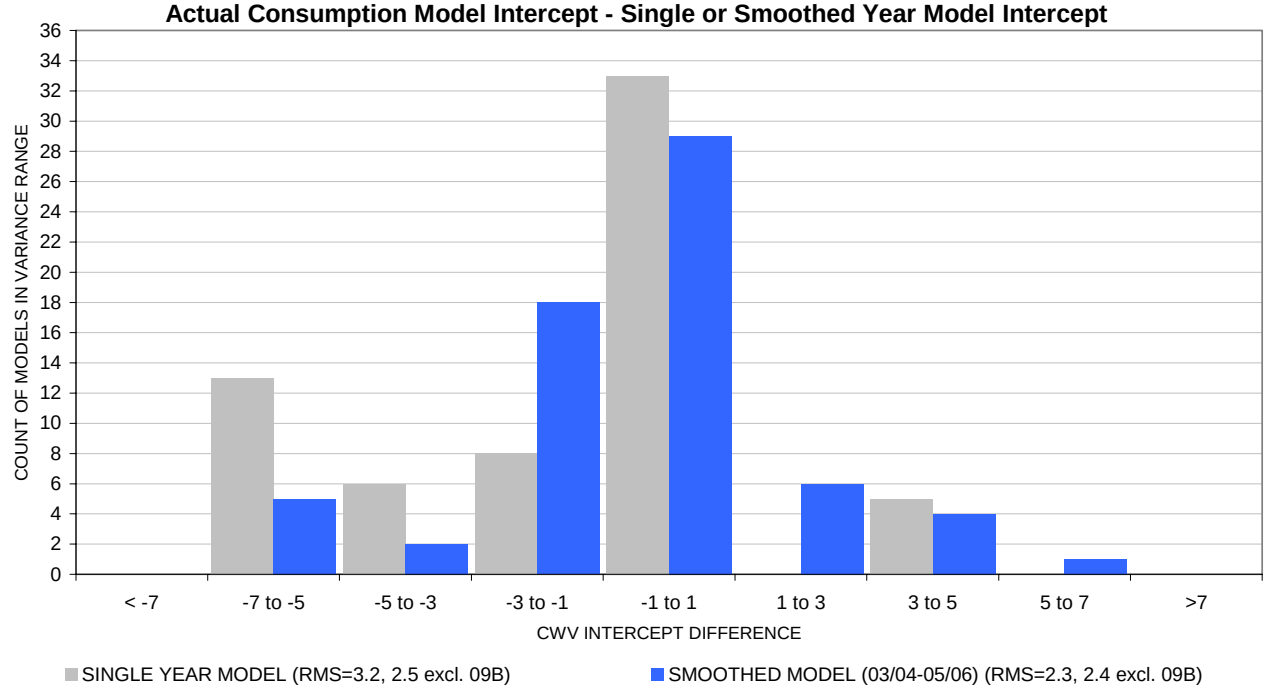

FIGURE 3: SMALL NDM EUCs PREDICTIVE ABILITY:
Actual Consumption Model Intercept - Single or Smoothed Year Model Intercept

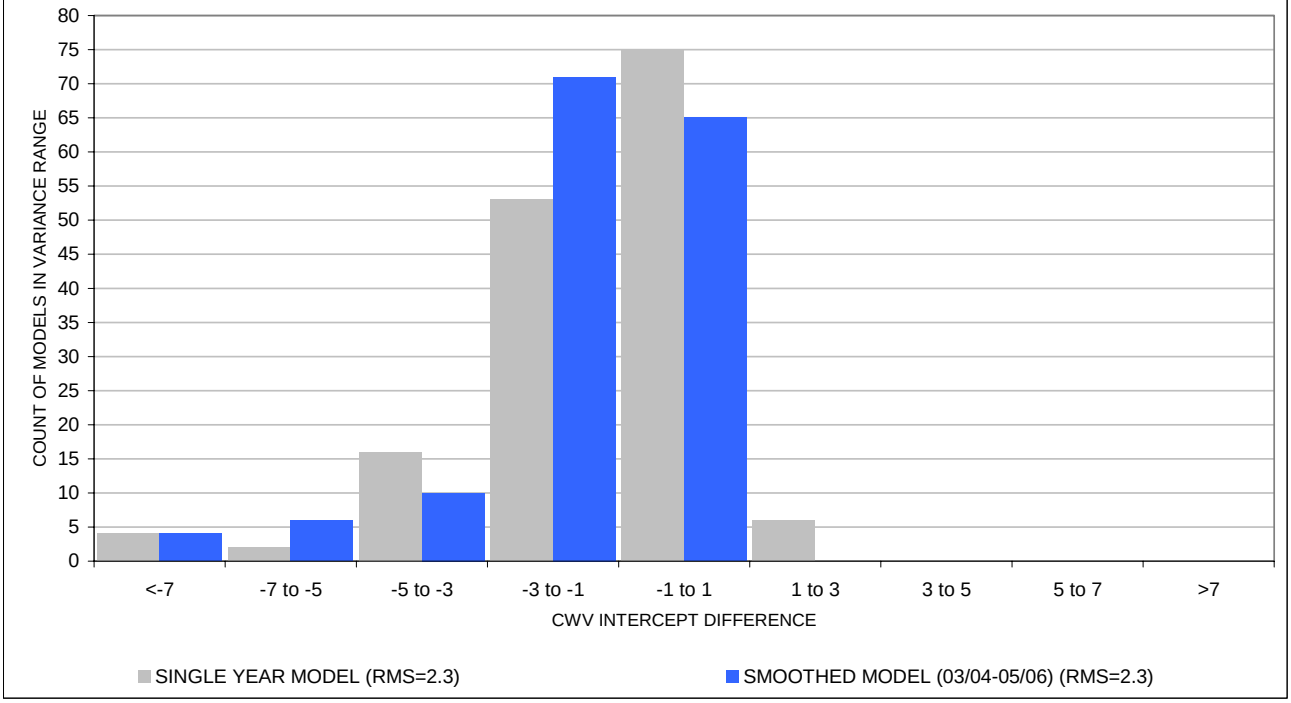

FIGURE 4: LARGE NDM EUCs PREDICTIVE ABILITY:
Actual Consumption Model Intercept - Single or Smoothed Year Model Intercept

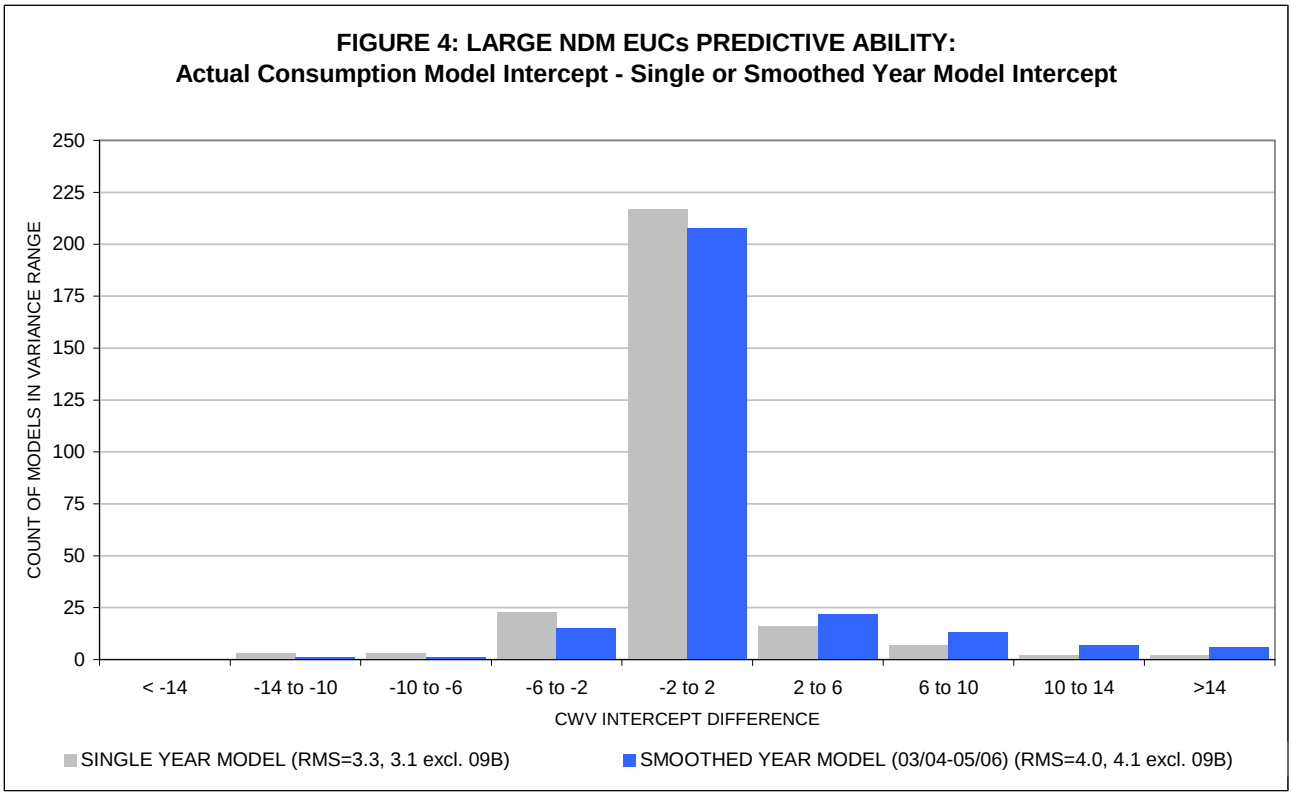

FIGURE 5: SMALL NDM EUCs YEAR ON YEAR VOLATILITY:
07/08 - 06/07 Single Year Model COMPARED TO to 07/08 - 06/07 Smoothed Model

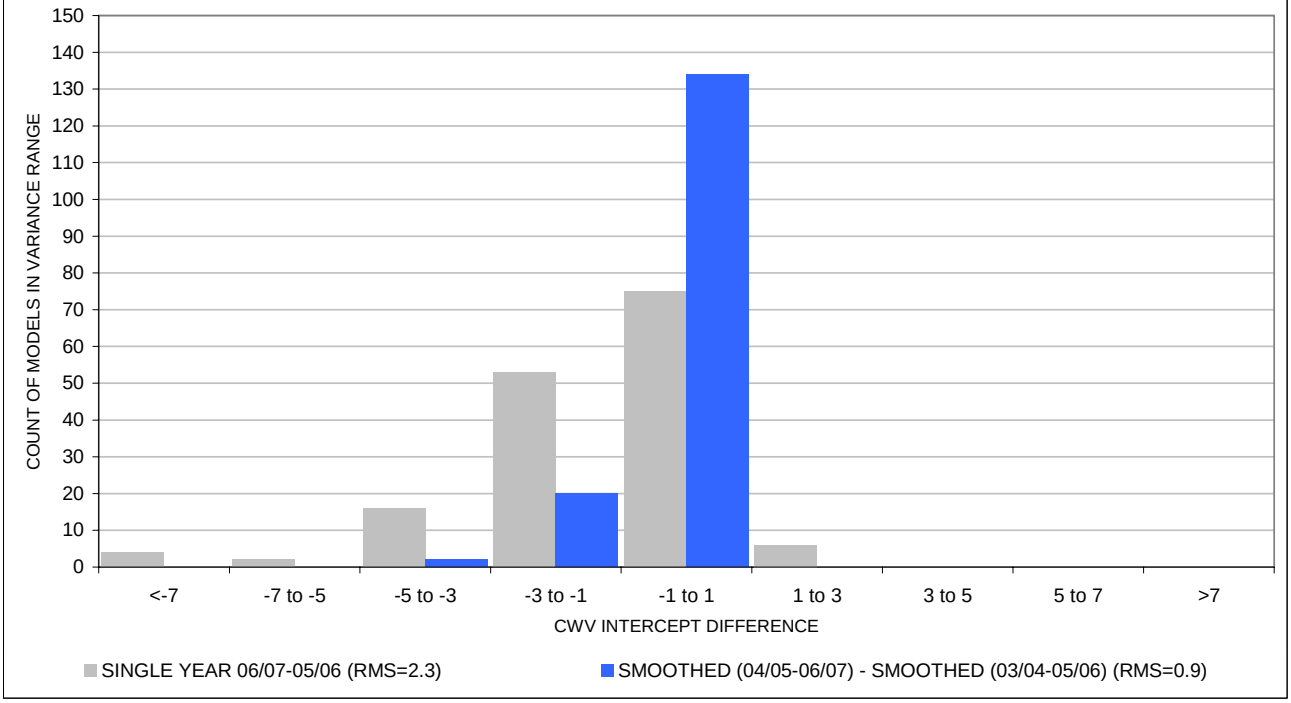

FIGURE 6: LARGE NDM EUCs YEAR ON YEAR VOLATILITY:
07/08 - 06/07 Single Year Model COMPARED TO to 07/08 - 06/07 Smoothed Model

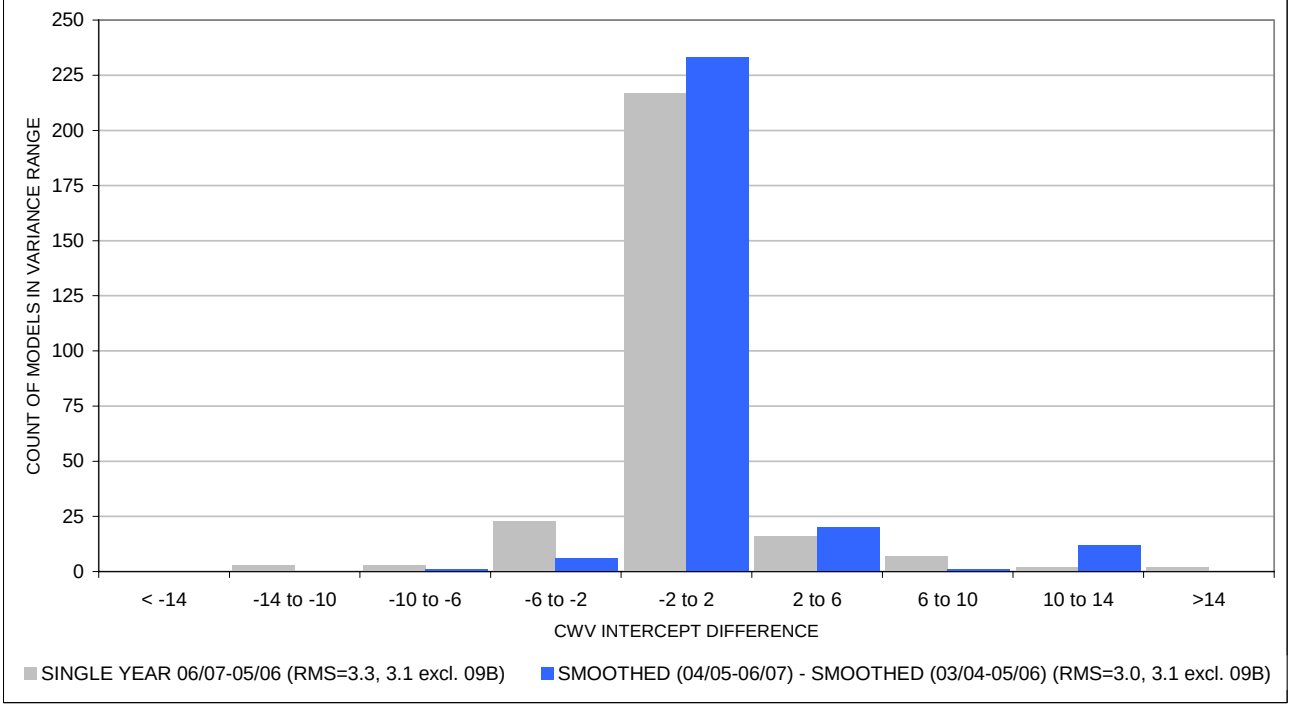

FIGURE 7: SMALL NDM CONSUMPTION BAND EUCs YEAR ON YEAR VOLATILITY: 07/08 - 06/07 Single Year Model COMPARED TO to 07/08 - 06/07 Smoothed Model

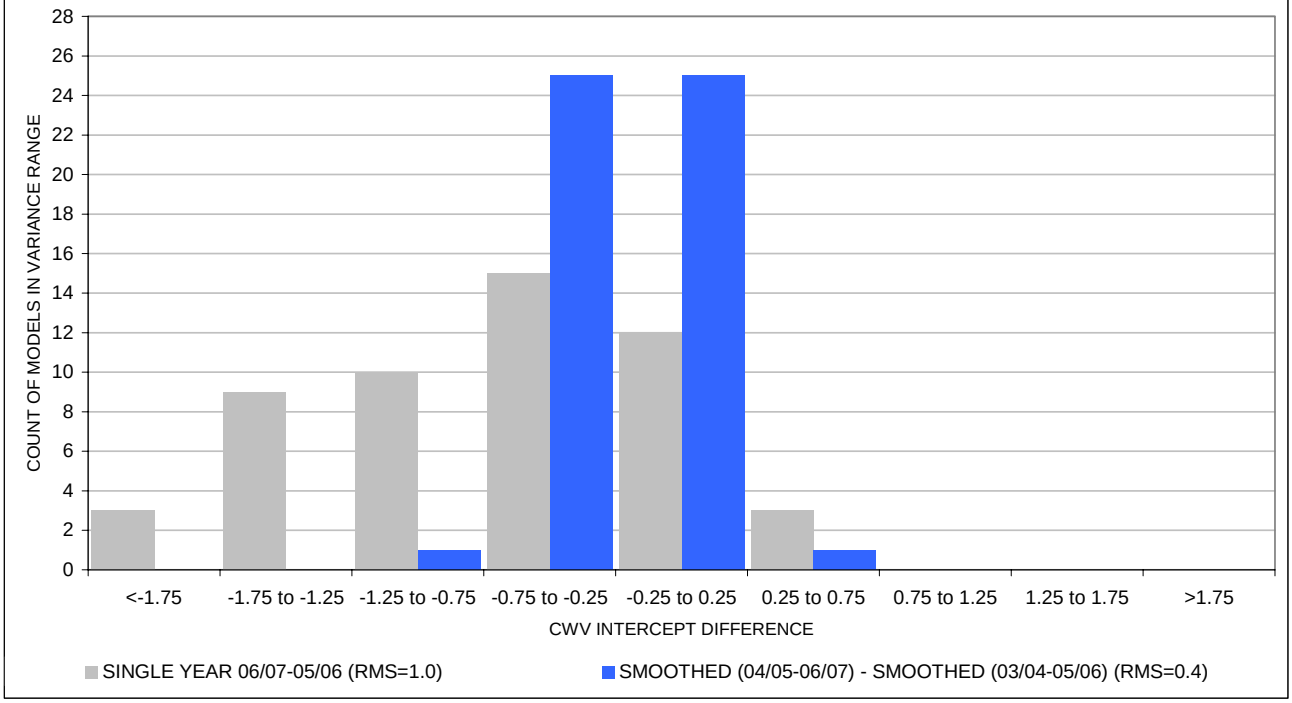

FIGURE 8: LARGE NDM CONSUMPTION BAND EUCs YEAR ON YEAR VOLATILITY: 07/08 - 06/07 Single Year Model COMPARED TO to 07/08 - 06/07 Smoothed Model

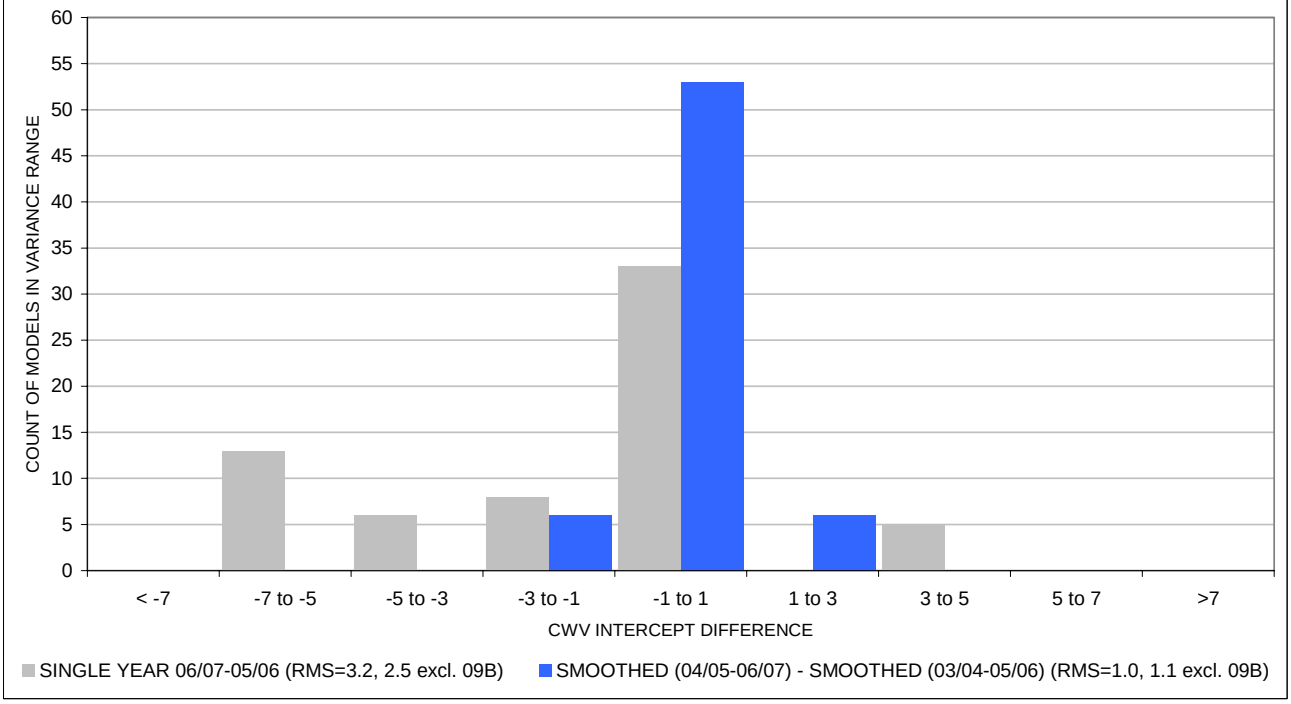

TABLE 1: CWV INTERCEPT PATTERNS
NDM DEMAND MODELS FOR 2004/05, 2005/06, 2006/07

Consumption Band EUCs

xx=LDZ=	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
xx:E0701B	UD	DD	UD	UD	UD	DU	UD	UD	UD	UD	UD	UD	DU
xx:E0702B	UU	UD	UU	UD	UD	UD	UU	UD	UD	UD	UD	UD	DU
xx:E0703B	UD	UD	UD	UD	UD	UD	UD	UD	DD	DD	DU	DD	DD
xx:E0704B	UD	UD	UD	UD	UD	UD	UD	DD	DD	UD	DD	UD	DD
xx:E0705B	DD	UD	UD	UD	UD	DU	UD	UU	DD	DD	DD	DD	DD
xx:E0706B	UD	UU	DU	UD	DU	DD	DU	UD	DU	UD	DU	DD	UD
xx:E0707B	UU	UU	UU	UD	UD	UD	UU	UD	UD	UD	UD	UD	UD
xx:E0708B	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD

First (i.e. Flattest, W01) WAR Bands in each Consumption Range

xx=LDZ=	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
xx:E0703W01	DU	DU	DD	DU	DD	UD	DD	DD	DD	DD	DD	DD	DD
xx:E0704W01	DU	DU	DD	DU	DD	UD	DD	DD	DD	DD	DD	DD	DD
xx:E0705W01	DU	DU	DU	DU	DU	DU	DU	UD	UD	DD	DD	UD	UD
xx:E0706W01	F	F	F	F	F	F	F	F	F	F	F	F	F
xx:E0707W01	F	F	F	F	F	F	F	F	F	F	F	F	F
xx:E0708W01	F	F	F	F	F	F	F	F	F	F	F	F	F

Second (i.e. W02) WAR Bands in each Consumption Range

xx=LDZ=	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
xx:E0703W02	DU	DU	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD
xx:E0704W02	DU	DU	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD
xx:E0705W02	DU	DU	DU	DU	DU	DU	DU	DD	DD	DD	DD	DD	DD
xx:E0706W02	DU	DU	DU	DU	DU	DU	DU	DD	DD	DD	DD	DD	DD
xx:E0707W02	UU	UU	UU	UU	UU	UU	UU	UU	UU	UU	UU	UD	UU
xx:E0708W02	UU	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD

Third (i.e. W02) WAR Bands in each Consumption Range

xx=LDZ=	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
xx:E0703W03	UD	DD	UD	DD	DD	DD	UD	UD	DD	UD	UD	UD	DD
xx:E0704W03	UD	DD	UD	DD	DD	DD	UD	UD	DD	UD	UD	UD	DD
xx:E0705W03	DU	DU	UD	DU	DU	DU	UD	UD	DD	DD	DD	DD	DD
xx:E0706W03	DU	DU	DU	DU	DU	DU	DU	UD	DD	DD	DD	DD	DD
xx:E0707W03	DU	DU	UD	DU	UD	UD	UD	UD	UD	UD	UD	UD	UD
xx:E0708W03	DU	DU	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD

Fourth (i.e. W02) WAR Bands in each Consumption Range

xx=LDZ=	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
xx:E0703W04	UD	UD	DD	UD	UD	UD	DD	UD	DD	DD	UD	DD	DD
xx:E0704W04	UD	UD	DD	UD	UD	UD	DD	UD	DD	DD	UD	DD	DD
xx:E0705W04	DU	DU	UD	DD	DD	DD	UD	UD	DD	DD	DD	DD	DD
xx:E0706W04	DU	DU	DU	DU	DU	UD	DU	UD	UD	UD	DD	DD	UD
xx:E0707W04	DU	UD	UD	UD	UD	UD	UD	UD	DD	DD	DD	DD	DD
xx:E0708W04	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD	UD

KEY		
UD	UP DOWN	(2004/05 < 2005/06 >2006/07)
DU	DOWN UP	(2004/05 >2005/06 <2006/07)
DD	DOWN DOWN	(2004/05 > 2005/06 > 2006/07)
UU	UP UP	(2004/05 < 2005/06 < 2006/07)
F	FLAT	(2004/05 = 2005/06 = 2006/07)

TABLE 2: CWV INTERCEPTS PATTERNS: NDM DEMAND MODELS FOR 2004/05, 2005/06 AND 2006/07
COUNTS OF CWV INTERCEPT PATTERN TYPES BY END USER CATEGORY AND BY LDZ

EUC	Type					Total	
	UU	UD	DU	DD	F		
xx:E0701B	0	10	2	1	0	13	
xx:E0702B	3	9	1	0	0	13	
xx:E0703B	0	8	1	4	0	13	
xx:E0703W01	0	1	3	9	0	13	
xx:E0703W02	0	11	2	0	0	13	
xx:E0703W03	0	7	0	6	0	13	
xx:E0703W04	0	7	0	6	0	13	
xx:E0704B	0	9	0	4	0	13	
xx:E0704W01	0	1	3	9	0	13	
xx:E0704W02	0	11	2	0	0	13	
xx:E0704W03	0	7	0	6	0	13	
xx:E0704W04	0	7	0	6	0	13	
xx:E0705B	1	5	1	6	0	13	
xx:E0705W01	0	4	7	2	0	13	
xx:E0705W02	0	0	7	6	0	13	
xx:E0705W03	0	3	5	5	0	13	
xx:E0705W04	0	3	2	8	0	13	
xx:E0706B	1	5	5	2	0	13	
xx:E0706W01	0	0	0	0	13	13	
xx:E0706W02	0	0	7	6	0	13	
xx:E0706W03	0	1	7	5	0	13	
xx:E0706W04	0	5	6	2	0	13	
xx:E0707B	6	5	1	1	0	13	
xx:E0707W01	0	0	0	0	13	13	
xx:E0707W02	12	1	0	0	0	13	
xx:E0707W03	0	10	3	0	0	13	
xx:E0707W04	0	7	1	5	0	13	
xx:E0708B	4	9	0	0	0	13	
xx:E0708W01	0	0	0	0	13	13	
xx:E0708W02	1	12	0	0	0	13	
xx:E0708W03	0	11	2	0	0	13	
xx:E0708W04	0	13	0	0	0	13	
xx:E0709B	0	13	0	0	0	13	
Total by Type	28	195	68	99	39	429	Autumn 2007
2003/04, 2004/05 and 2005/06 Analysis Years	109	169	65	48	38	429	Autumn 2006
2002/03, 2003/04 and 2004/05 Analysis Years	99	111	151	33	35	429	Autumn 2005
2001/02, 2002/03 and 2003/04 Analysis Years	62	95	182	57	33	429	Autumn 2004
2000/01, 2001/02 and 2002/03 Analysis Years	21	145	130	94	39	429	Autumn 2003
1999/00, 2000/01 and 2001/02 Analysis Years	66	194	80	50	39	429	Autumn 2002
1998/99, 1999/00 and 2000/01 Analysis Years	39	83	186	82	39	429	Autumn 2001
1997/98, 1998/99 and 1999/00 Analysis Years	77	223	58	31	40	429	Autumn 2000
1996/97, 1997/98 and 1998/99 Analysis Years	57	46	233	54	39	429	Autumn 1999

LDZ	Type					Total
	UU	UD	DU	DD	F	
SC	5	10	14	1	3	33
NO	3	10	14	3	3	33
NW	4	16	6	4	3	33
NE	2	16	9	3	3	33
EM	2	16	7	5	3	33
WM	2	17	7	4	3	33
WN	4	16	6	4	3	33
WS	2	23	0	5	3	33
EA	1	13	1	15	3	33
NT	1	16	0	13	3	33
SE	1	15	2	12	3	33
SO	0	15	0	15	3	33
SW	1	12	2	15	3	33
Total	28	195	68	99	39	429

KEY	
UU	Increasing trend
UD	Increasing then decreasing trend
DU	Decreasing then increasing trend
DD	Decreasing trend
F	Flat model

TABLE 3: CWV INTERCEPTS PATTERNS: NDM DEMAND MODELS FOR 2003/04, 2004/05, 2005/06 AND 2006/07
COUNTS OF CWV INTERCEPT PATTERN TYPES BY END USER CATEGORY AND BY LDZ

EUC	Type				Total	
	N	U	D	F		
xx:E0701B	13	0	0	0	13	
xx:E0702B	13	0	0	0	13	
xx:E0703B	10	3	0	0	13	
xx:E0703W01	12	1	0	0	13	
xx:E0703W02	13	0	0	0	13	
xx:E0703W03	11	2	0	0	13	
xx:E0703W04	13	0	0	0	13	
xx:E0704B	10	3	0	0	13	
xx:E0704W01	12	1	0	0	13	
xx:E0704W02	13	0	0	0	13	
xx:E0704W03	11	2	0	0	13	
xx:E0704W04	13	0	0	0	13	
xx:E0705B	9	4	0	0	13	
xx:E0705W01	13	0	0	0	13	
xx:E0705W02	12	1	0	0	13	
xx:E0705W03	13	0	0	0	13	
xx:E0705W04	11	2	0	0	13	
xx:E0706B	12	0	1	0	13	
xx:E0706W01	1	0	0	12	13	
xx:E0706W02	13	0	0	0	13	
xx:E0706W03	13	0	0	0	13	
xx:E0706W04	13	0	0	0	13	
xx:E0707B	8	0	5	0	13	
xx:E0707W01	0	0	0	13	13	
xx:E0707W02	1	0	12	0	13	
xx:E0707W03	13	0	0	0	13	
xx:E0707W04	13	0	0	0	13	
xx:E0708B	13	0	0	0	13	
xx:E0708W01	0	0	0	13	13	
xx:E0708W02	12	0	1	0	13	
xx:E0708W03	13	0	0	0	13	
xx:E0708W04	13	0	0	0	13	
xx:E0709B	13	0	0	0	13	
Total by Type	353	19	19	38	429	Autumn 2007
2003/04, 2004/05 and 2005/06 Analysis Years	355	10	29	35	429	Autumn 2006
2002/03, 2003/04 and 2004/05 Analysis Years	360	9	25	35	429	Autumn 2005
2001/02, 2002/03 and 2003/04 Analysis Years	364	23	9	33	429	Autumn 2004
2000/01, 2001/02 and 2002/03 Analysis Years	353	32	5	39	429	Autumn 2003
1999/00, 2000/01 and 2001/02 Analysis Years	352	26	12	39	429	Autumn 2002
1998/99, 1999/00 and 2000/01 Analysis Years	348	15	27	39	429	Autumn 2001
1997/98, 1998/99 and 1999/00 Analysis Years	361	15	14	39	429	Autumn 2000

LDZ	Type				Total
	N	U	D	F	
SC	28	1	2	2	33
NO	26	2	2	3	33
NW	28	0	2	3	33
NE	26	2	2	3	33
EM	27	1	2	3	33
WM	28	0	2	3	33
WN	28	0	2	3	33
WS	25	4	1	3	33
EA	27	2	1	3	33
NT	27	2	1	3	33
SE	27	2	1	3	33
SO	29	1	0	3	33
SW	27	2	1	3	33
Total	353	19	19	38	429

KEY	
N	No consistent trend over 4 years
U	Increasing trends over 4 years
D	Decreasing trends over 4 years
F	Flat models

FIGURE 10: Load Factors for each LDZ - xx:E0701B

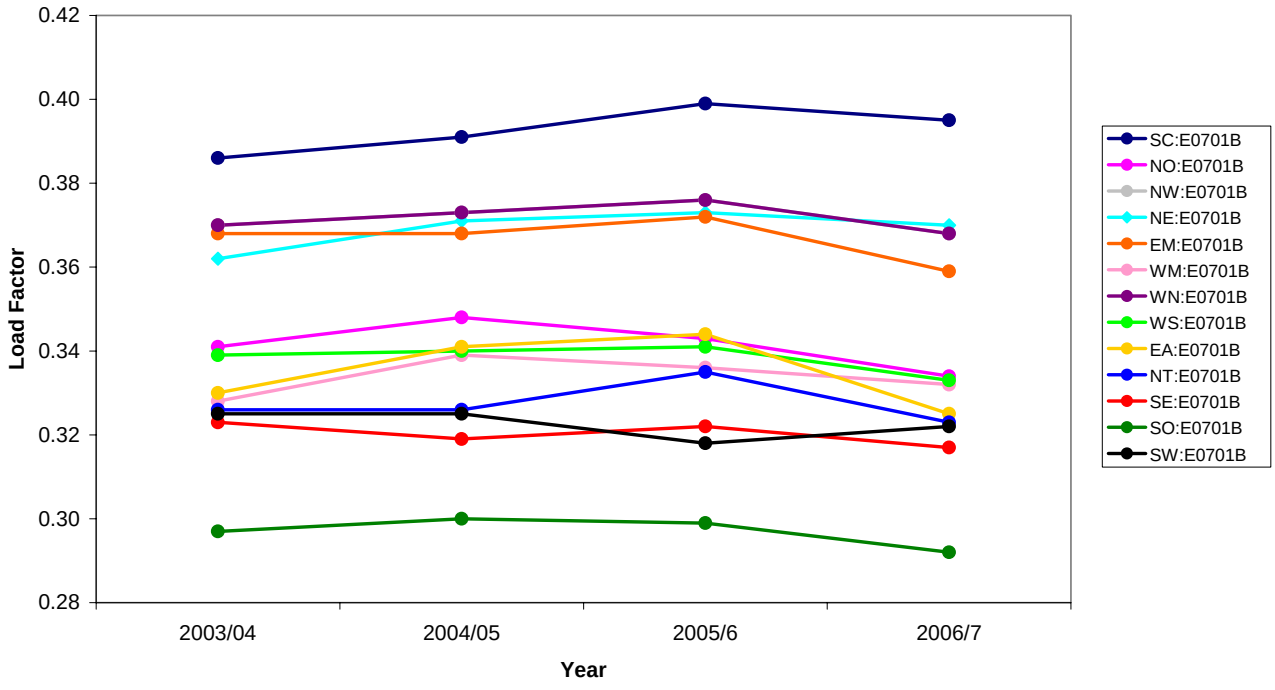

FIGURE 11: Load Factors for each LDZ - xx:E0702B

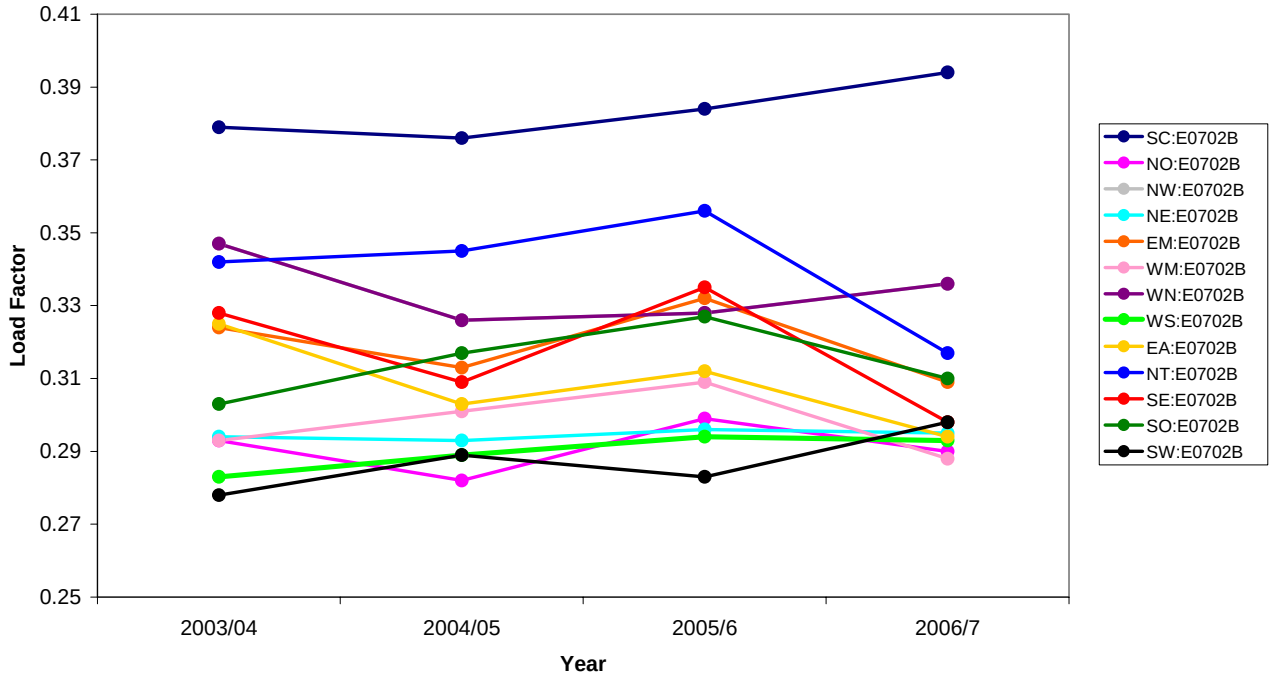

FIGURE 12: Load Factors for each LDZ - xx:E0703B

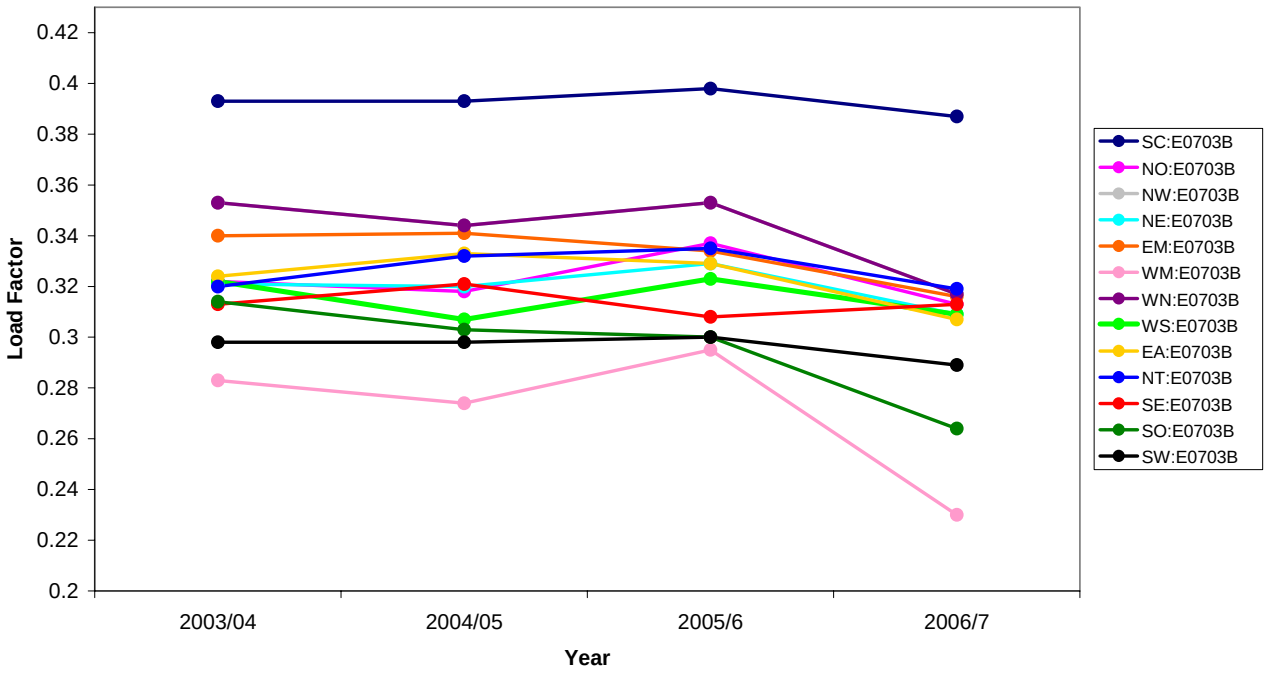

FIGURE 13: Load Factors for each LDZ - xx:E0704B

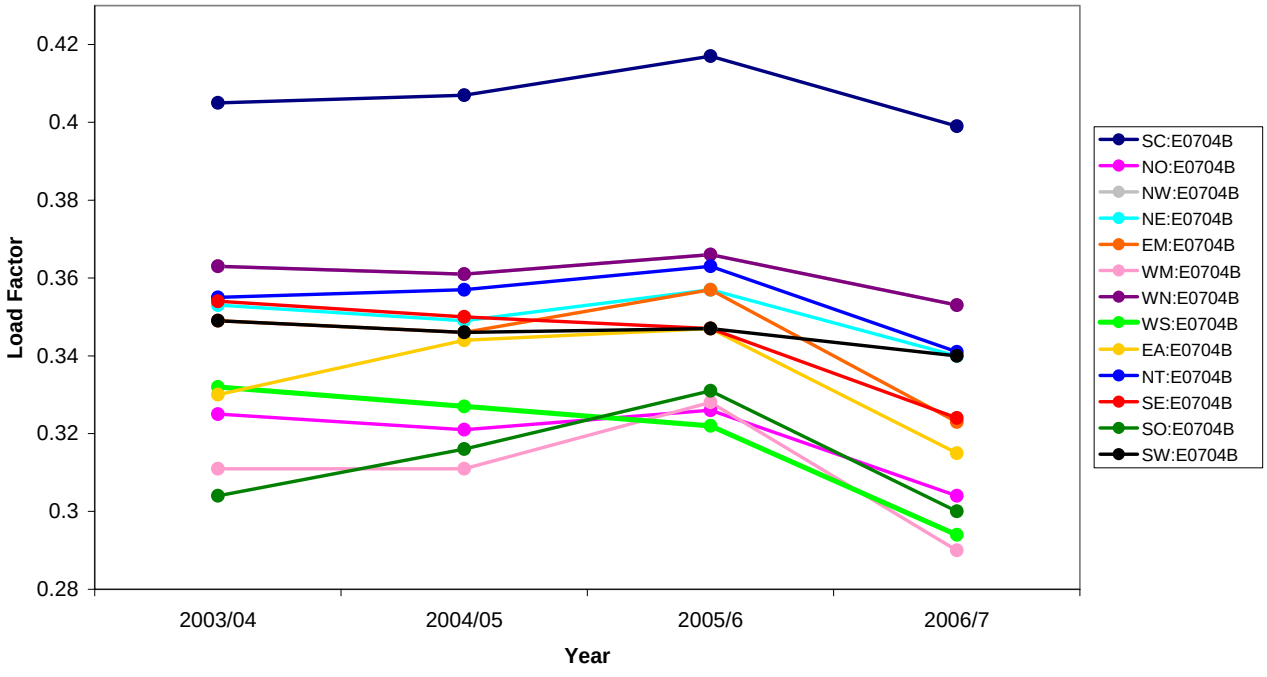

FIGURE 14: Load Factors for each LDZ - xx:E0705B

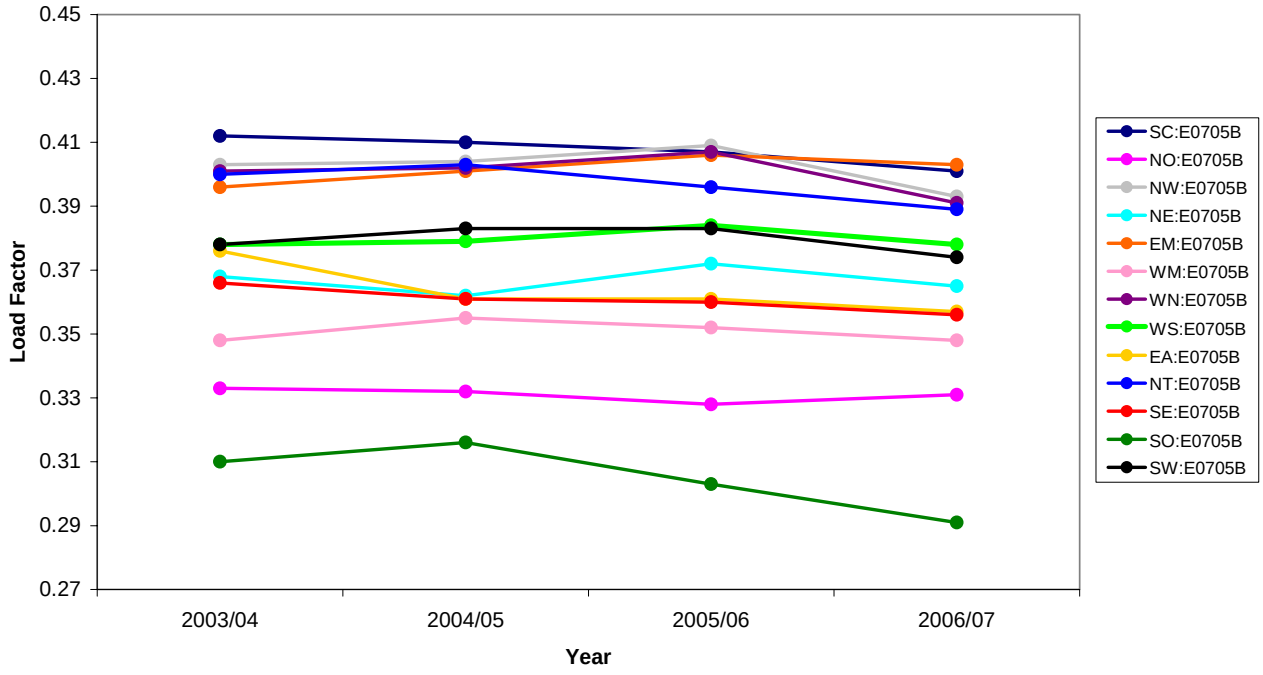

FIGURE 15: Load Factors for each LDZ - xx:E0706B

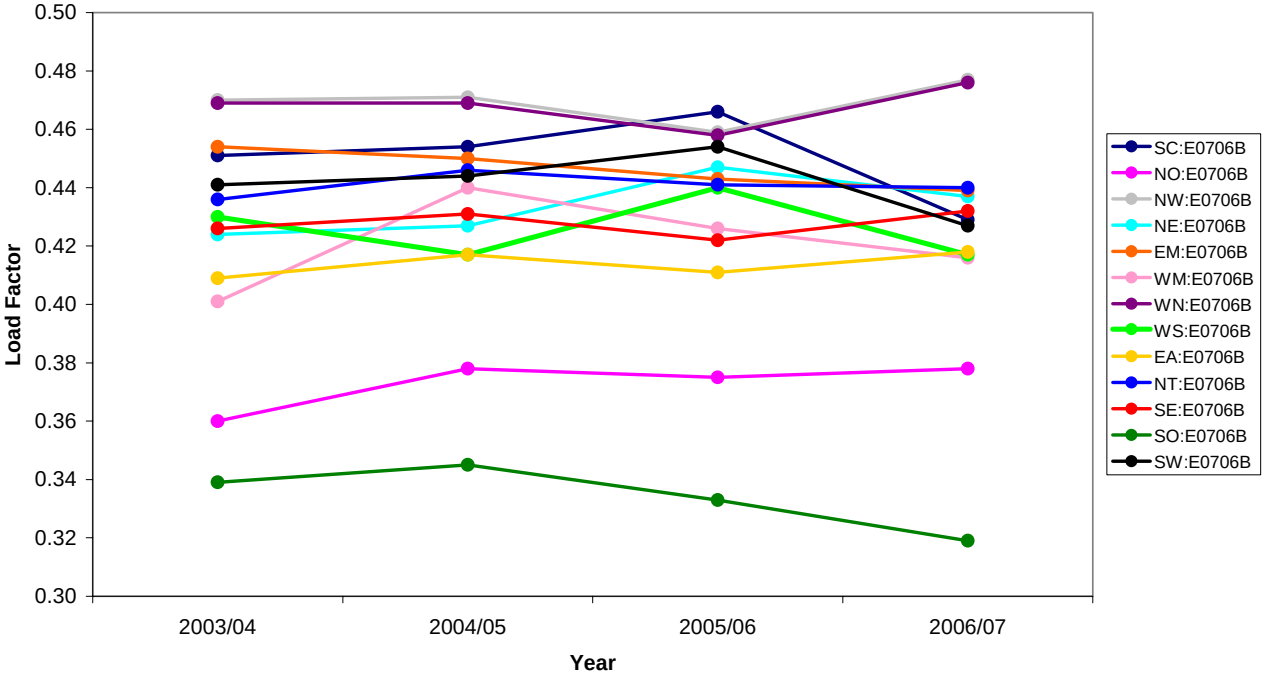

FIGURE 16: Load Factors for each LDZ - xx:E0707B

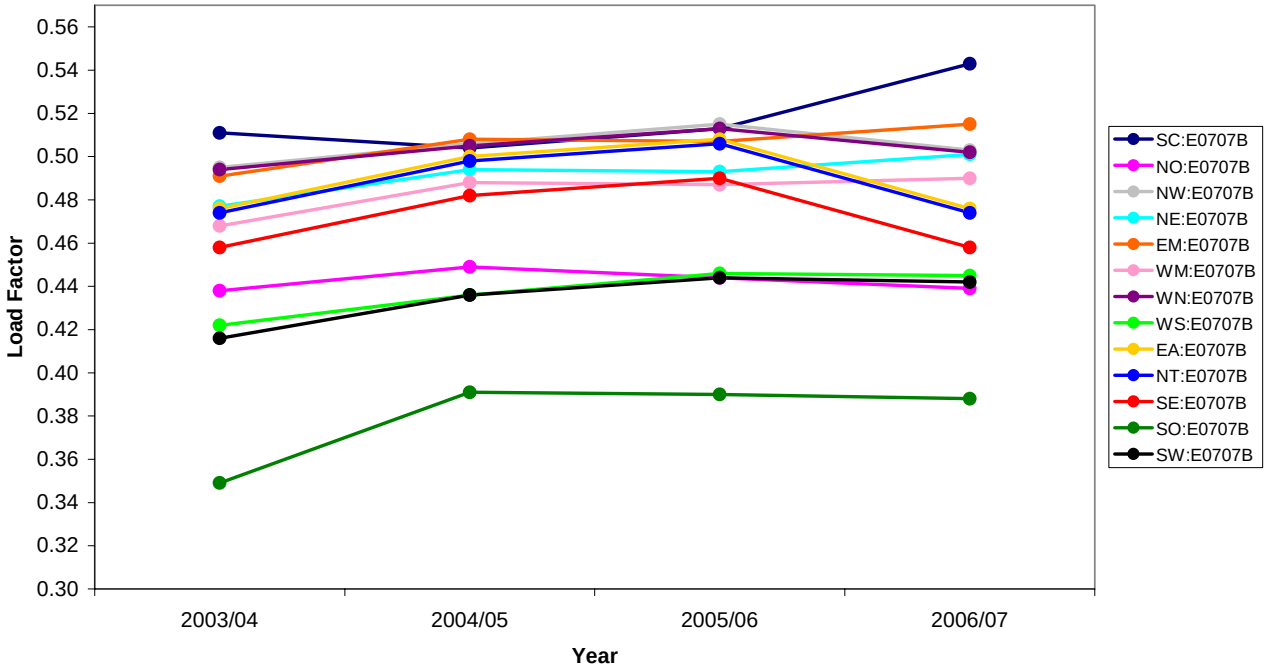

FIGURE 17: Load Factors for each LDZ - xx:E0708B

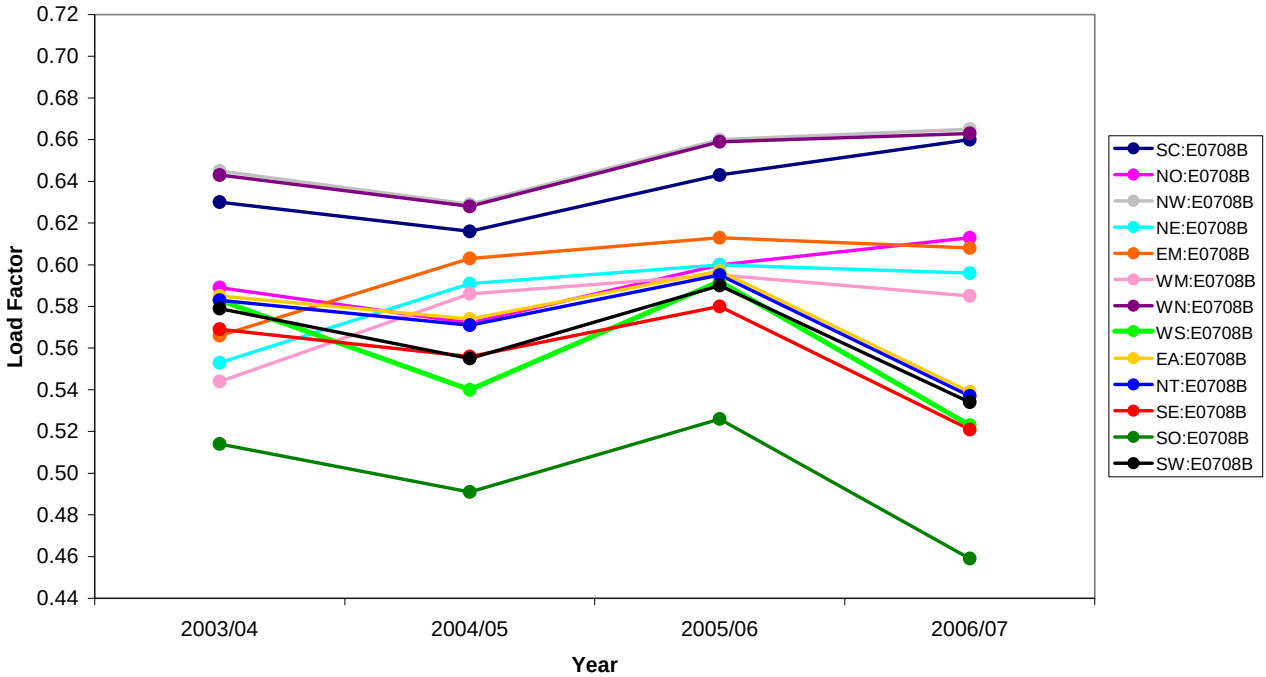

FIGURE 18: Load Factors for each LDZ - xx:E0709B

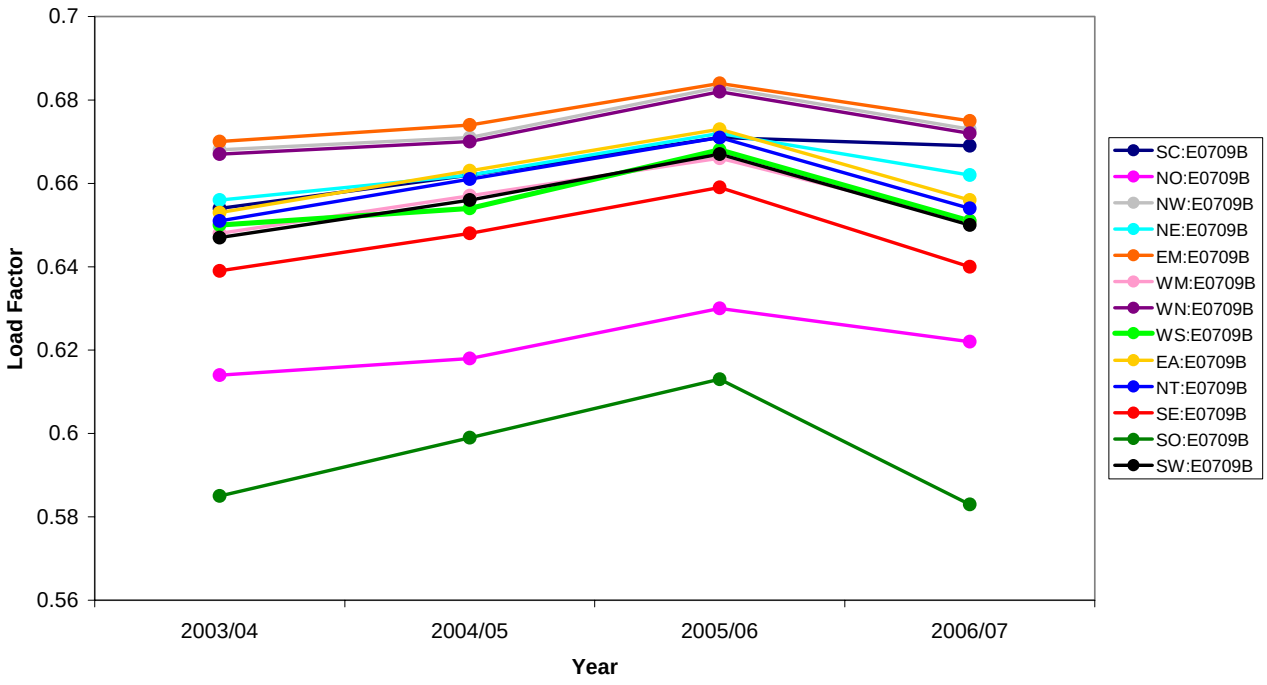

FIGURE 19: Load Factors for each LDZ - xx:E0707W02