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DESC: NDM Algorithm Performance (Gas year 2010/11)

Strand 2: Reconciliation Variance Analysis & NDM Sample Analysis

1st February 2012



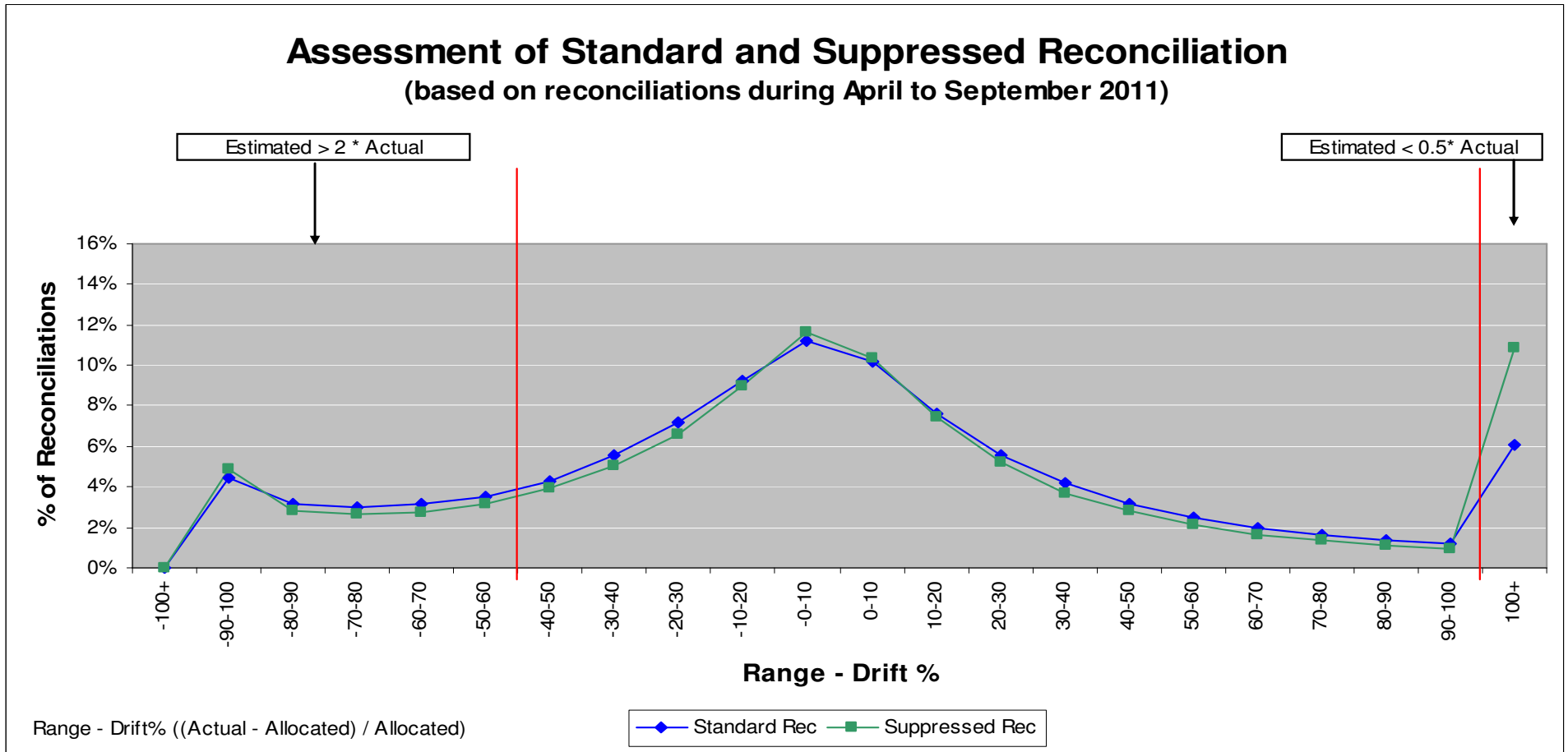
Algorithm Performance 2010/11: Strand 2 Analysis

- Strand 1 (**SF and WCF analysis**) presented at Nov 2011 DESC
 - SF generally closer to 1 (improvement compared with 09/10)
 - WCF deviation improved in 10/11 (compared with 09/10)
- Strand 2: **Reconciliation Variance Analysis**
 - Compare allocated demand (derived from algorithms) *with*
 - Actual demand obtained from available reconciliation data
- Strand 2: **NDM Sample Consumption Analysis**
 - Compare the actual demand from the NDM sample data *with*
 - Allocated demand for the sample
- Supporting document: detailed explanation with full examples

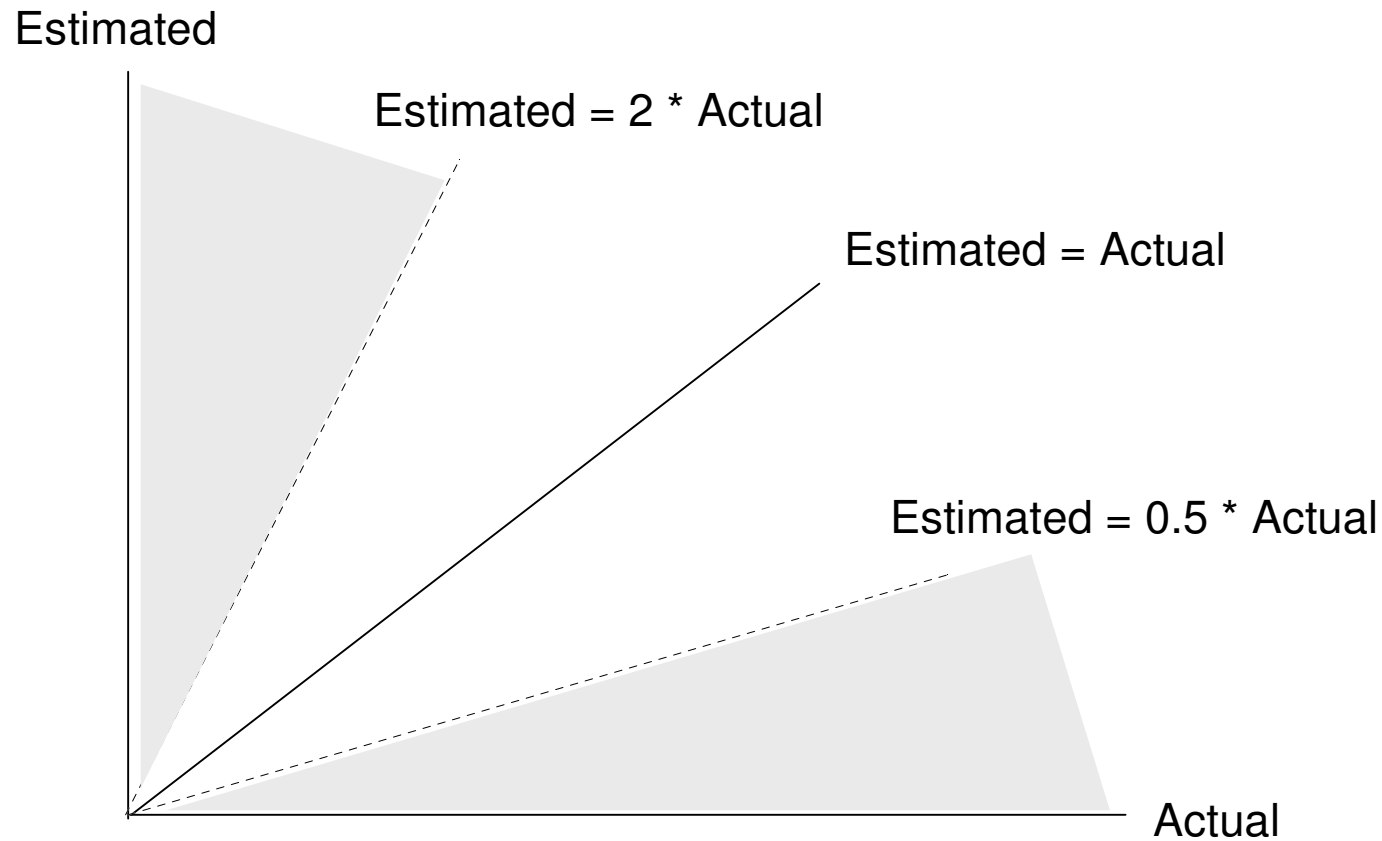
Reconciliation Variance (RV) Analysis

- Compare actual demand (rec.) to allocated demand (algorithms)
- Use *available* Meter Point rec. data for band 'B' EUCs
 - Data available at time of analysis (non-monthly, smaller EUC may not have been received)
 - No analysis for EUC Band 1 (no rec.)
 - Uses Standard & Suppressed rec.
- Rejection criteria applied prior to analysis to remove inappropriate or erroneous rec. data
 - Negative and zero consumptions, actual to allocated ratio
- Profile comparisons are then compared and categorised as:
 - 'Peaky' - 'Flat' - 'Ok'

Assessment of Standard and Suppressed Reconciliation

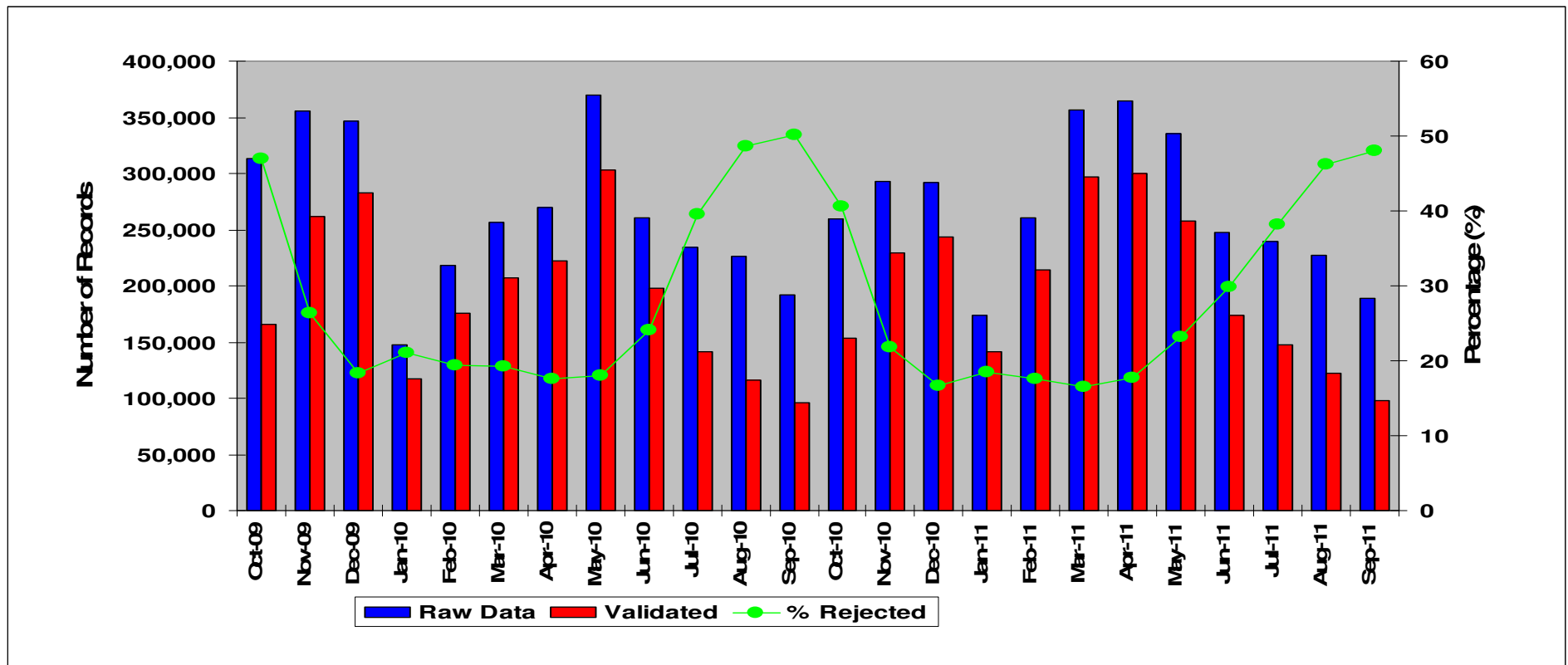


RV Analysis - Data Envelope



RV Analysis: Levels of Validation Fall Out

- Rejection Criteria: AQ ≤ 3 kWh ; Actual ≤ 0 ; Actual > 0 and Allocated $> 2 * \text{Actual}$; Actual > 0 and Allocated $< 0.5 * \text{Actual}$



- Rejection rates higher in summer due to smaller consumptions thereby resulting in greater % differences
- Profiles consistent with previous years and post-validation numbers good

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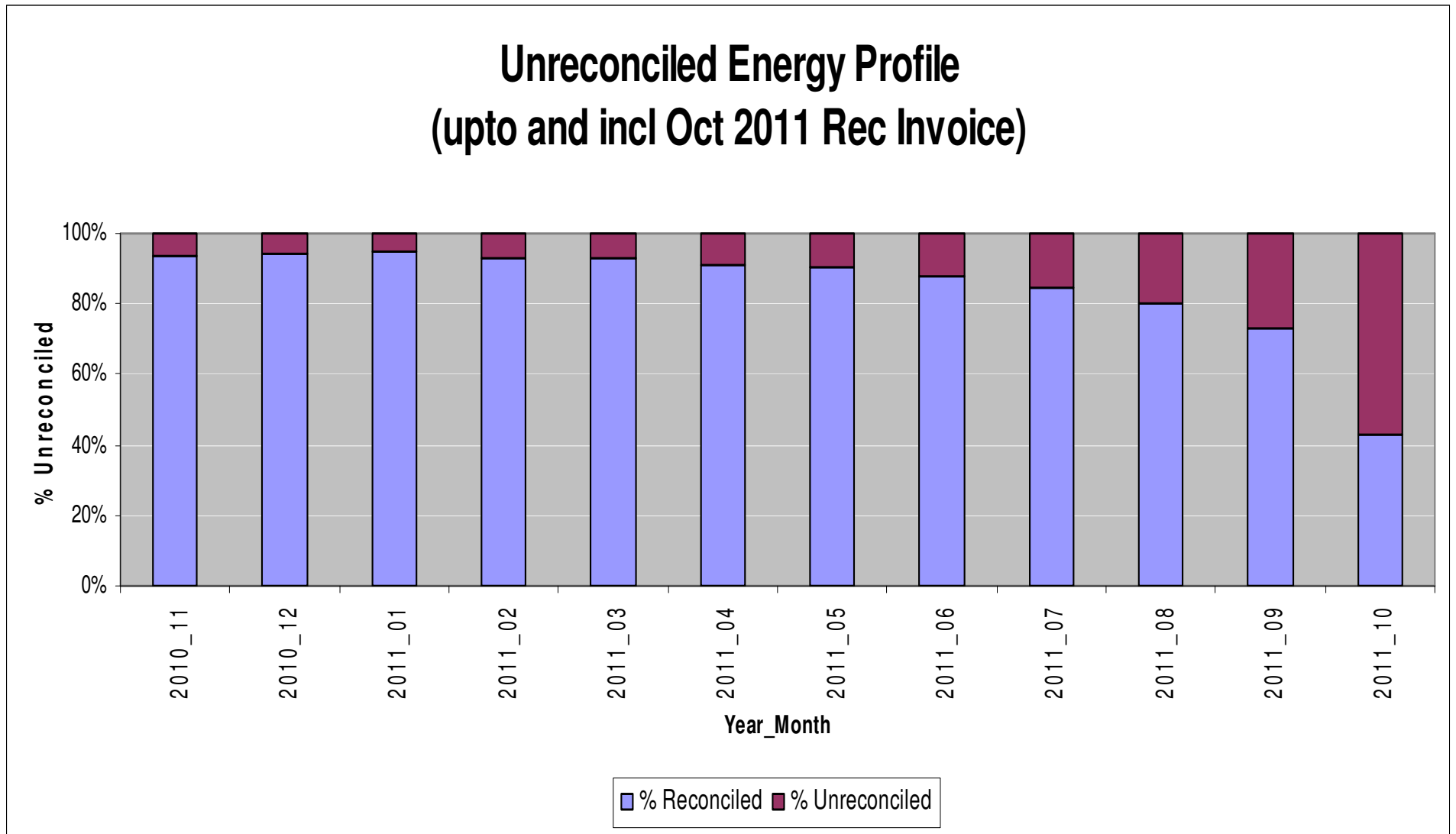
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RV Analysis: Rejections – approx. breakdown

Rejection category	Minimum 16.5% (March 2011)	Maximum 48.0% (September 2011)
AQ \leq 3 kWh pa	1.4%	1.2%
Actual $<$ 0	1.3%	1.7%
Actual = 0	3.1%	9.4%
Actual $>$ 0 and Allocated $>$ 2 * Actual	7.0%	22.2%
Actual $>$ 0 and Allocated $<$ 0.5 * Actual	3.7%	13.5%

- Table shows the rejection category breakdown for:
 - March 2011 - which had the smallest rejection %
 - September 2011 - which had the largest rejection %

RV Analysis: Unreconciled Energy Profile

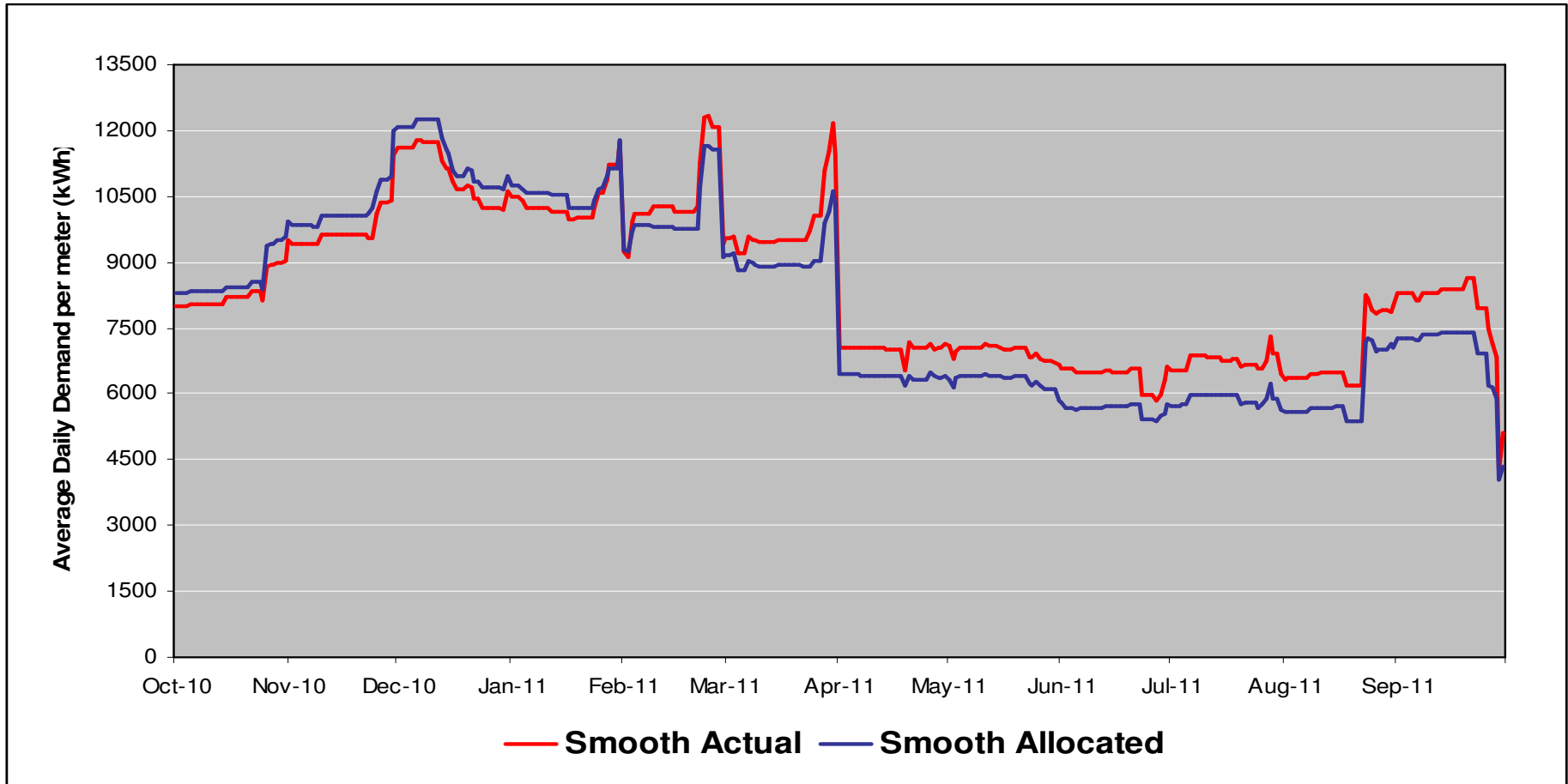


RV Analysis: Methodology

- Following removal of rejected reconciliations, for each meter point:
 - Reconciled energy is identified
 - Allocated Energy calculated
 - Values are then applied evenly to each day of the reconciliation period
 - Average for each of the meter points in the specific EUC is calculated
- Profile is 'scaled'
 - Level of allocated demand (based on AQ) = actual demand (actual)
- Scaling allows profile comparisons and analysis of algorithm performance
 - Without scaling analysis would primarily highlight differences in demand levels (affected by other factors)
- Example charts for cross section of EUC Bands (B) and LDZs provided in supporting document

NW : Consumption Band 06 (Pre-Scaling)

RV Analysis – Allocated to Actual

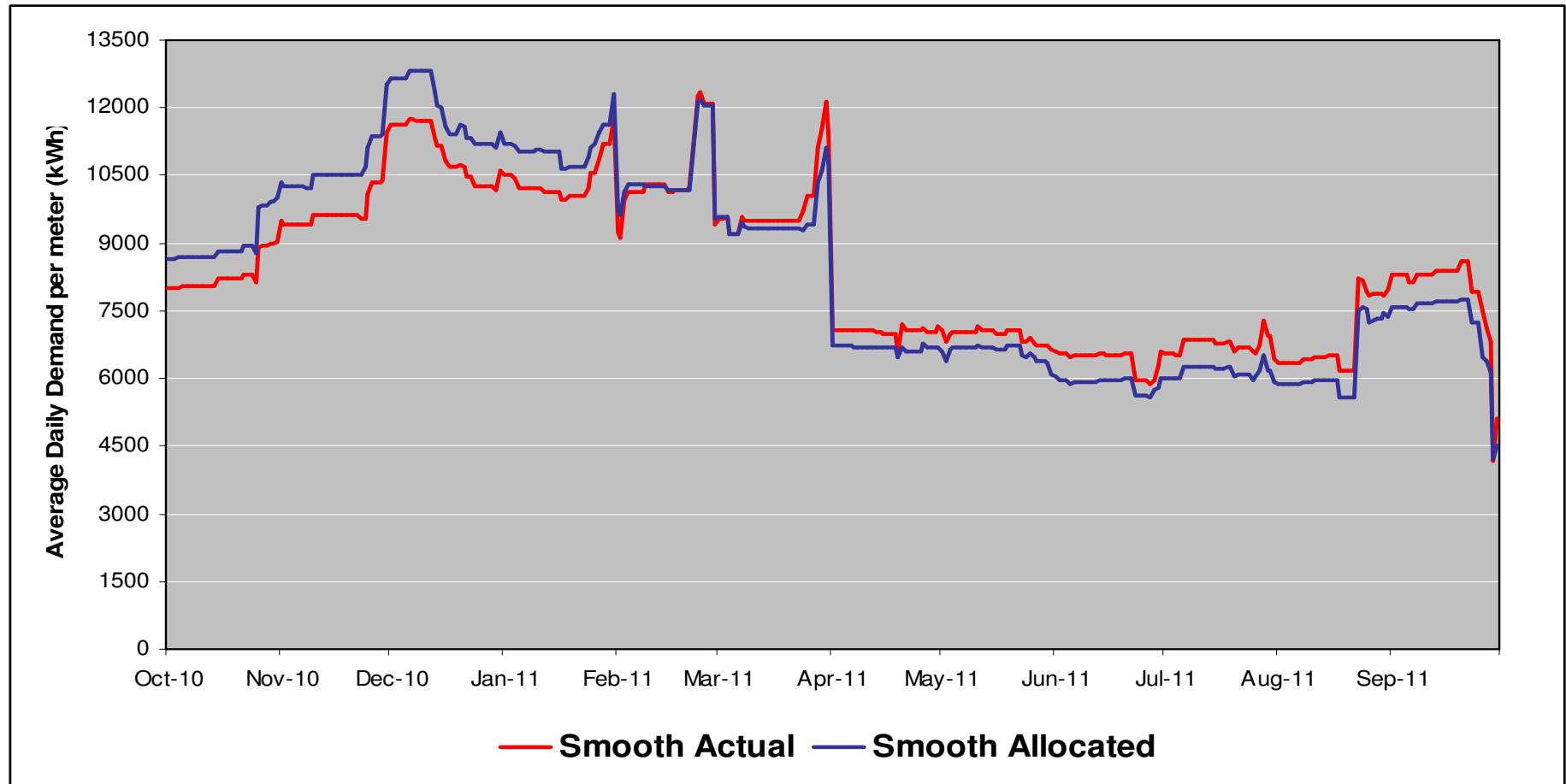


- 1st chart highlights where scaling has not occurred and profile of demand through the year.
- Following scaling.....

NW : Consumption Band 06 (After Scaling)

RV Analysis – Allocated to Actual

11


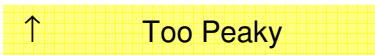

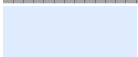
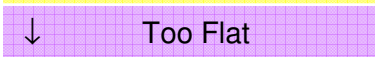
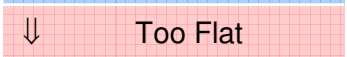


- Analysis allows comparison of the profiles rather than demand levels
- Indicates an over allocation in the Winter & under allocation in the summer
- **'Peaky' allocated profile:** Winter over, Summer under (predominant profile)

RV Categorisation: LDZ / EUC Profile & Error Levels

Gas Year 2010/11

EUC	BAND	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
02	B	↑	↑	↑	↑↑	↑	↑	↑↑	↑	↑	↑	↑	↑	↑↑
03	B	↑	↑↑	↑↑	↑↑	↑↑	↑	↑↑	↑↑	↑	↑	↑	↑	↑
04	B	~	~	~	~	↑	~	~	↑	~	~	~	~	~
05	B	~	~	~	↑↑	↑	↑	↑↑	~	~	↑	~	↓	↓
06	B	↑	↑↑	↑↑	~	~	~	↑↑	↑↑	~	~	↓	~	~
07	B	↑↑	↑↑	↑	↑↑	↑↑	~	↓	↑↑	↑↑	↓	↑	↑↑	↑↑
08	B		~	↑↑	~	↑							↑↑	↑↑
09	B													

Ok / Good		5% Level		10 % Level	
No Data (<2)					

- ‘% level’ = average difference of allocated to actual over the winter and summer differences (measures ‘peakiness’)
- 2010/11: ‘Peaky’ profile 50%, ‘Ok’ profile 26%, ‘Flat’ 5%, No data for analysis 19%
- 2009/10: ‘Peaky’ profile 53%, ‘Ok’ Profile 28%, ‘Flat’ 5%, No data for analysis 14%
- Profiles overall more ‘Peaky’



RV Analysis: Conclusions

- RV analysis highlights a ‘peaky’ trend of:
 - Over Allocation – Winter
 - Under Allocation – Summer
- 2010/11 saw 50% of profiles defined as ‘peaky’ (53% in 09/10):
 - Levels of rec. rejected similar to previous years
 - Available rec. for analysis incomplete, particularly Bands 2/3 (non-monthly read meters)
 - Analysis is revised in Spring 2012 - more data will be available
- BUT – analysis not necessarily representative of population
 - Consider with SF and WCF analysis *and* NDM Sample data...

NDM Sample Consumption Analysis

- Using the actual NDM Sample consumption for 10/11
 - Compare the % error of sample consumption against three models :
 - Allocated using 10/11 ALPs & DAFs, real system WCF and SF - (“As Used”)
 - Allocated using 10/11 ALPs & DAFs, EWCF and SF = 1 – (Best Estimate '10)
 - Allocated using 11/12 ALPs & DAFs, 10/11 EWCF and SF = 1 – (Best Estimate '11)
 - This is completed by EUC for all LDZs and also by month by LDZ
- Supporting document - detailed explanation with full examples

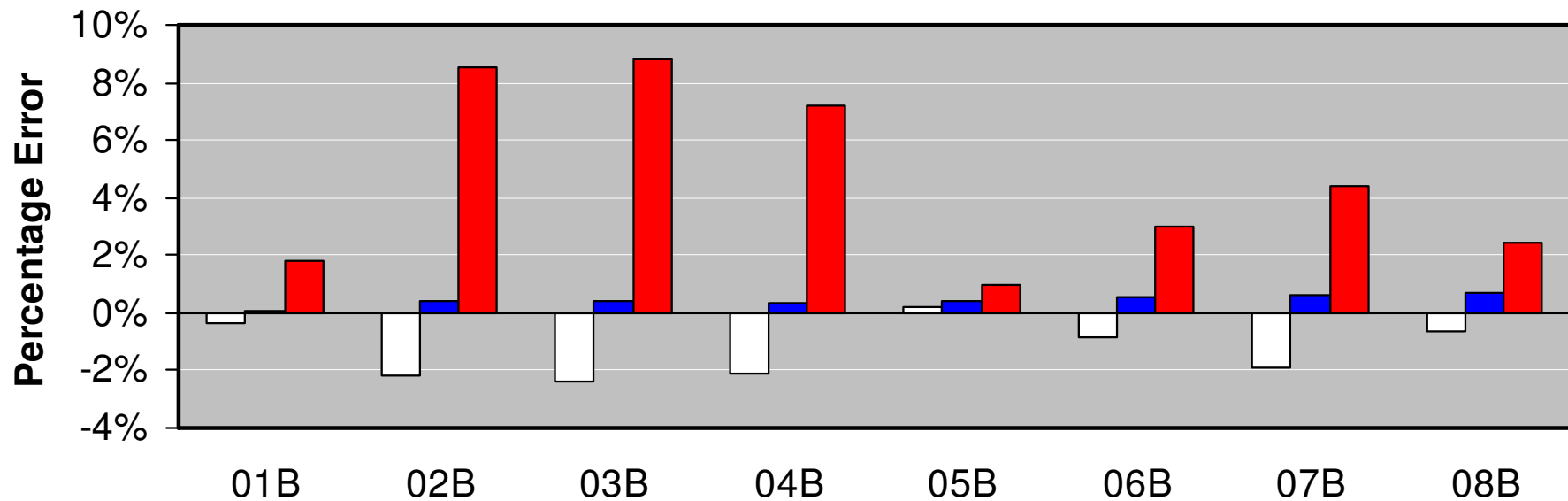
Allocated Error As % of Actual Demand

Weighted average across LDZs. 'As Used'

System WCF and SF – ALPs and DAFs 10/11 Algorithms - NDM Sample derived AQs (not system AQs)

Figure 3.1

Error as a Percentage of Demand - average across LDZs: 'As Used'



Actual WCF and SF
Actual ALPs and DAFs

□ Oct 10 - Mar 11 ■ Oct 10 - Sep 11 ■ Apr 11 - Sep 11

- Positive errors = Under allocation; Negative errors = Over allocation.
- Over year: Slightly positive errors across all consumption bands over (indicate population AQs too high)
- 'As Used' model uses real system SFs which have taken population AQs into account.
- AQs used based on sample consumption which is also expected to be lower than equivalent system AQs
- 'As Used' model does not assess EUC profiles, however can provide indicator of system AQ excess.....

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As Used Model – AQ Assessment

LDZ	Estimated AQ Excess (+) or Deficit (-) (‘as used’ analysis full year errors)	Observed AQ Reductions in Gemini at start of gas year 2011/12
SC	0.4%	-0.7%
NO	2.1%	-2.6%
NW	1.2%	-1.9%
NE	0.0%	-0.6%
EM	0.2%	0.2%
WM	0.8%	-1.0%
WN	-	-1.1%
WS	0.6%	-2.2%
EA	0.2%	-0.5%
NT	0.0%	-0.5%
SE	0.6%	-0.5%
SO	0.4%	-1.1%
SW	0.8%	-1.4%
Overall	0.6%	-1.0%

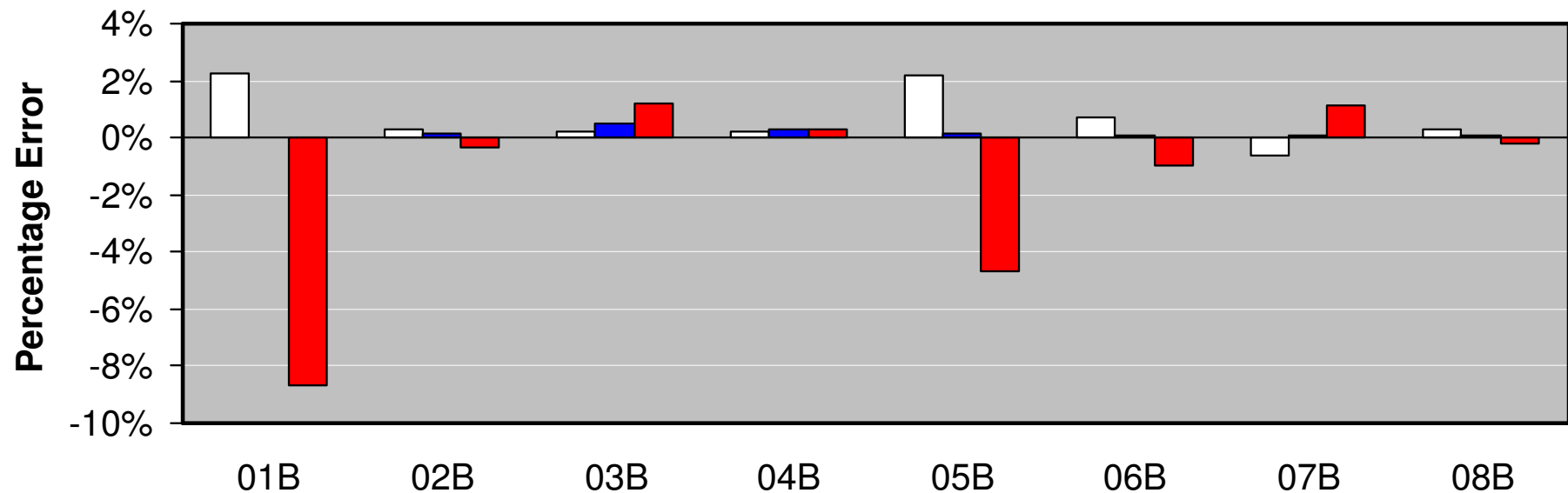
Allocated Error As % of Actual Demand

Weighted average across LDZs. 'Best Estimate 10'

EWCF and SF = 1 – ALPs and DAFs 10/11 Algorithms - NDM Sample derived AQs (not system AQs)

Figure 3.2

Error as a Percentage of Demand - average across LDZs: 'Best Estimate 10'



EWCF and SF = 1
ALPs and DAFs : 2010/11

□ Oct 10 - Mar 11 ■ Oct 10 - Sep 11 ■ Apr 11 - Sep 11

- Remove SF impact and use EWCF which avoids potential bias in WCF
- Positive errors = Under allocation ; Negative errors = Over allocation
- Winter/Summer analysis indicates bands 01,02,05,06 & 08 little too flat and 03,04 & 07 little too peaky
- Over year: Little overall error in each band (Range 0.01% and 0.47% for all bands)

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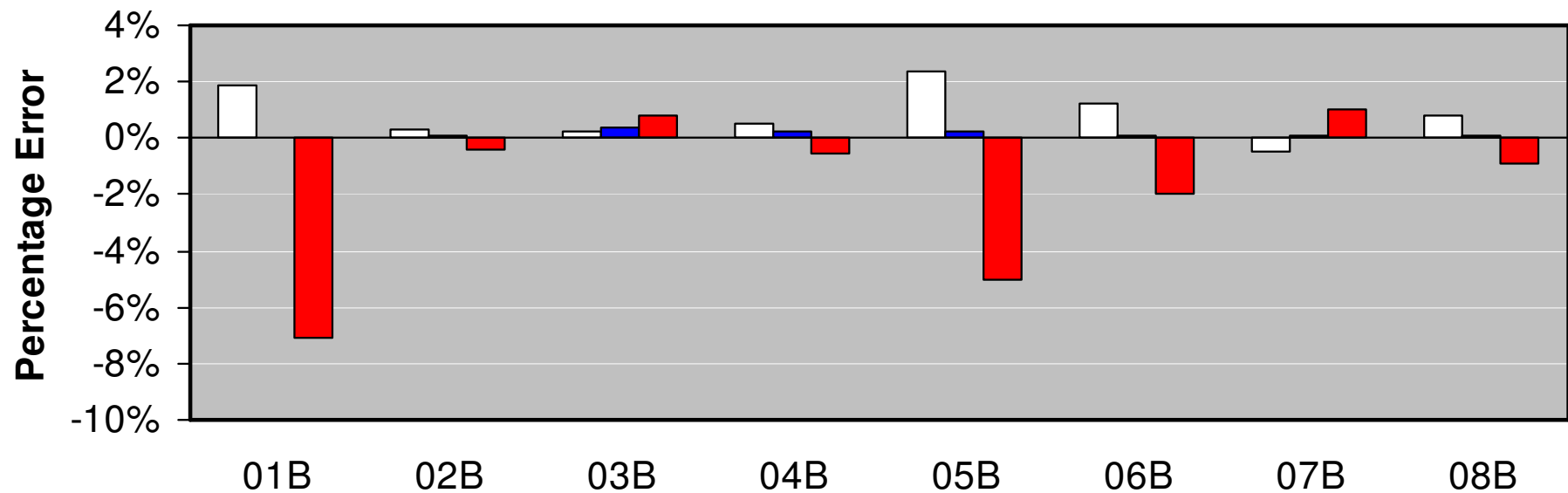
Allocated Error As % of Actual Demand

Weighted average across LDZs. 'Best Estimate 11'

EWCF and SF =1 – ALPs and DAFs 11/12 Algorithms - NDM Sample derived AQs (not system AQs)

Figure 3.3

Error as a Percentage of Demand - average across LDZs: 'Best Estimate 11'



EWCF and SF = 1

ALPs and DAFs : 2011/12

□ Oct 10 - Mar 11 ■ Oct 10 - Sep 11 ■ Apr 11 - Sep 11

- ALPs and DAFs for 2011/12 applied to 2010/11 consumption data
- Should provide less error as ALPs and DAFs were derived from this consumption data
- Winter / Summer errors are slightly improved for bands 01,03 and 07. Slightly worse for 02,04,05,06 and 08
- Over whole year extent of error is slightly reduced using 11/12 algorithms in most EUCs
- Monthly analysis also completed...

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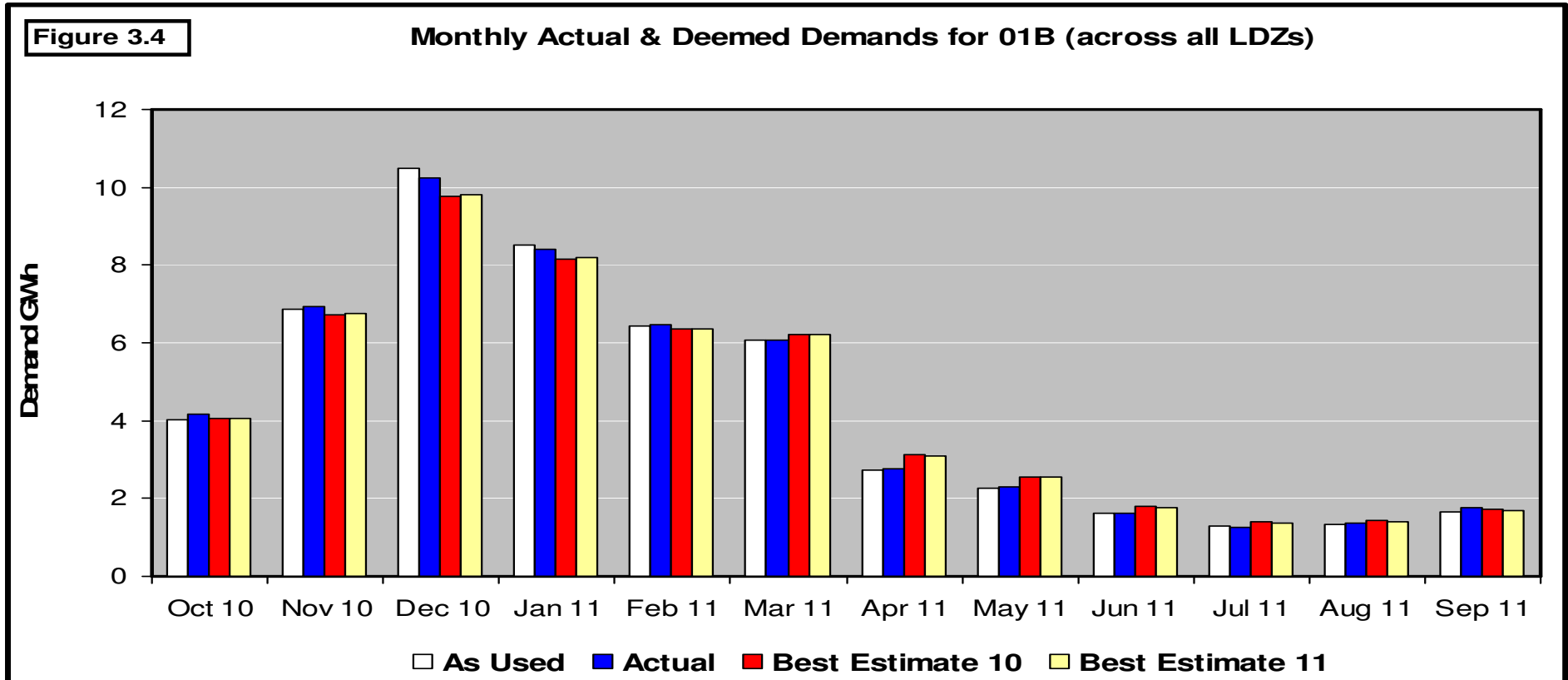


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Monthly Actual & Deemed Demand

01B (All LDZs)

As previous but by EUC and By Month



- Results also provided for previous models but by EUC Band and Month - Equivalent charts for all consumption bands included in supporting document
- Band 01B profile – indicates winter under allocation and summer over allocation
- Relevant to recall weather conditions in 10/11 when interpreting results
 - Winter months slightly colder than seasonal normal (coldest December in over 100 years)
 - During Summer months April, May and September were warmer than seasonal normal in contrast to June, July & August which were slightly cooler.

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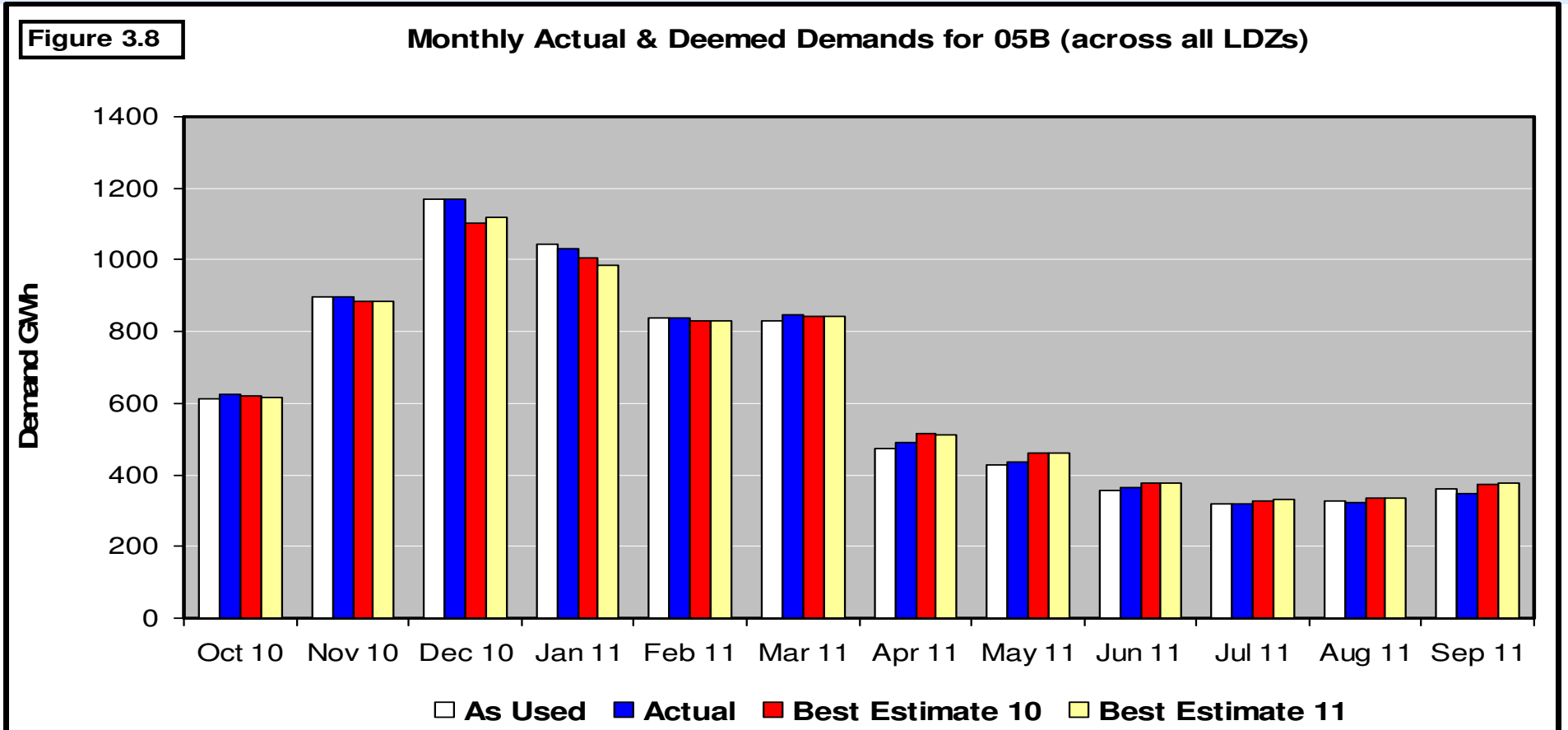


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Monthly Actual & Deemed Demand

05B (All LDZs)

As previous but by EUC and By Month



- Band 05B profile – indicates winter under allocation and summer over allocation

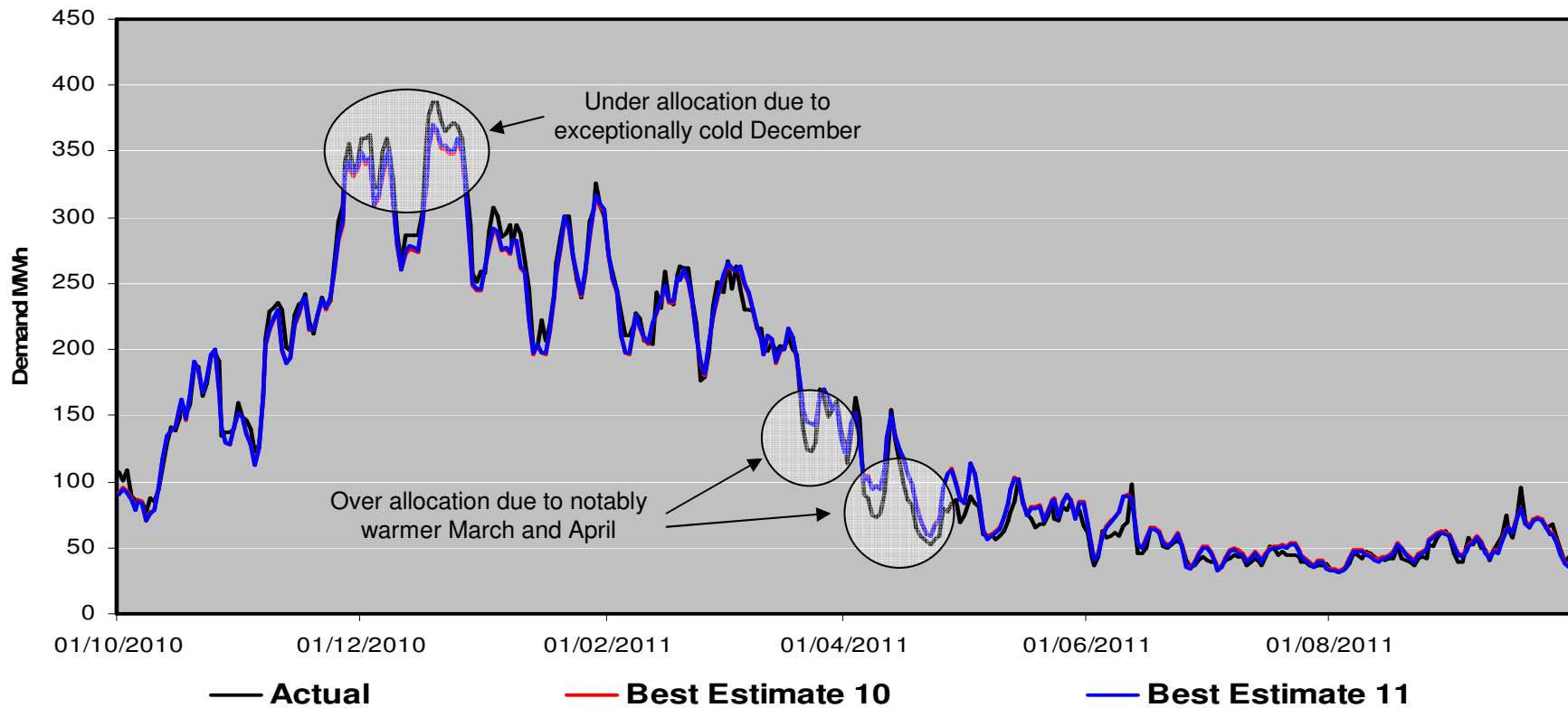


Daily Actual & Deemed Demand

01B (All LDZs)

Figure 3.19

Daily Actual and Deemed Demands for 01B (across all LDZs)



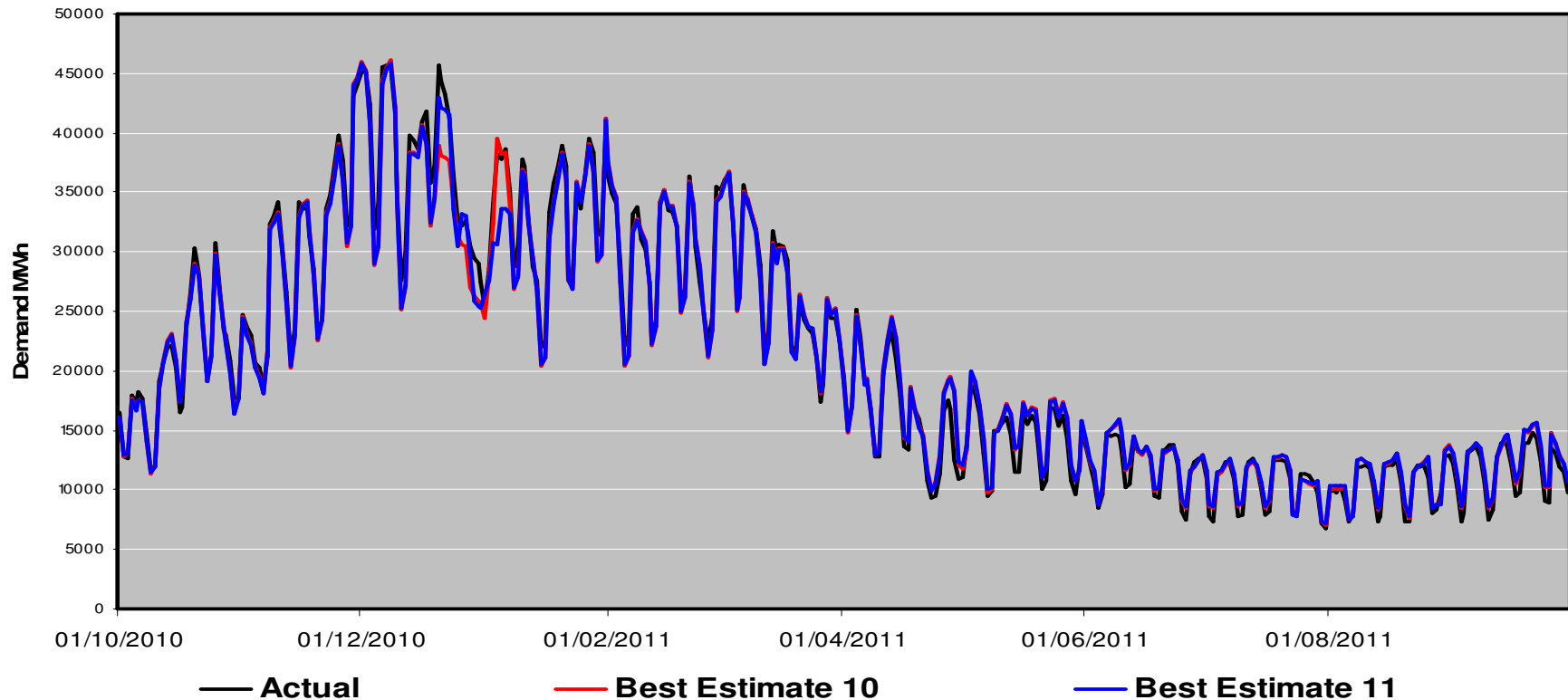
- The daily chart for Band 01 shows that allocated demand was generally close to actual demand. The most notable exception to this occurred during the coldest December in over 100 years and the unseasonably warm weather during March and April.

Daily Actual & Deemed Demand

05B (All LDZs)

Figure 3.23

Daily Actual and Deemed Demands for 05B (across all LDZs)



- The daily chart for Band 05 shows that allocated demand was generally close to actual demand. The most notable exception to this occurred during the unseasonably cold weather in December and the Christmas holiday period.
- Remember difference in Christmas holiday codes used in Best Estimate 10 and 11

RV Analysis & NDM Sample Analysis

- The “best estimate 10” & “best estimate 11” analyses suggest:
 - For bands 01, 02, 05, 06 & 08: under allocation (+ve errors) in the winter and over allocation (-ve errors) in the summer. → profile too flat.
 - For bands 03, 04 & 07: over allocation (+ve errors) in the winter and under allocation (-ve errors) in the summer. → profile too peaky.
- The RV analysis indicated profiles that were:
 - too peaky in most LDZs in bands 02 & 03 (overall too peaky, at 5% level in band 02, at 10% level in band 03)
 - good in most LDZs in bands 04 (& in 6 LDZs in band 05) (overall slightly too peaky in bands 04 & 05, below 5% level)
 - mixture of good, too peaky and too flat profiles in bands 06, 07 08 (overall too peaky, at 5% level in band 06, at 10% level in bands 07) and 08)

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RV Analysis & NDM Sample Analysis Conclusions

- Limitations - different, restricted data sets
 - Analyses based on different data sets - neither are necessarily representative of population as a whole
 - RV analysis excludes band 01B & based on a sub-set of rec data
 - Spring 2012 RV analysis is updated to provide better representation
 - NDM sample analysis is based on validated NDM SAMPLE data
 - Both analyses suffer from small numbers of contributing meter/supply points at the higher consumption bands
- Important Point: Both approaches, subject to their limitations, suggest only small inaccuracies over the year as a whole
- This year adhoc analysis completed to investigate specific periods of interest to DESC in more detail
- Full explanatory document on Joint Office website:
 - 'Evaluation of Algorithm Performance 201011.pdf'