DESC: NDM Algorithm Performance (Gas year 2012/13)

Strand 2: Reconciliation Variance Analysis
&
Strand 3: NDM Sample Analysis

12th February 2014

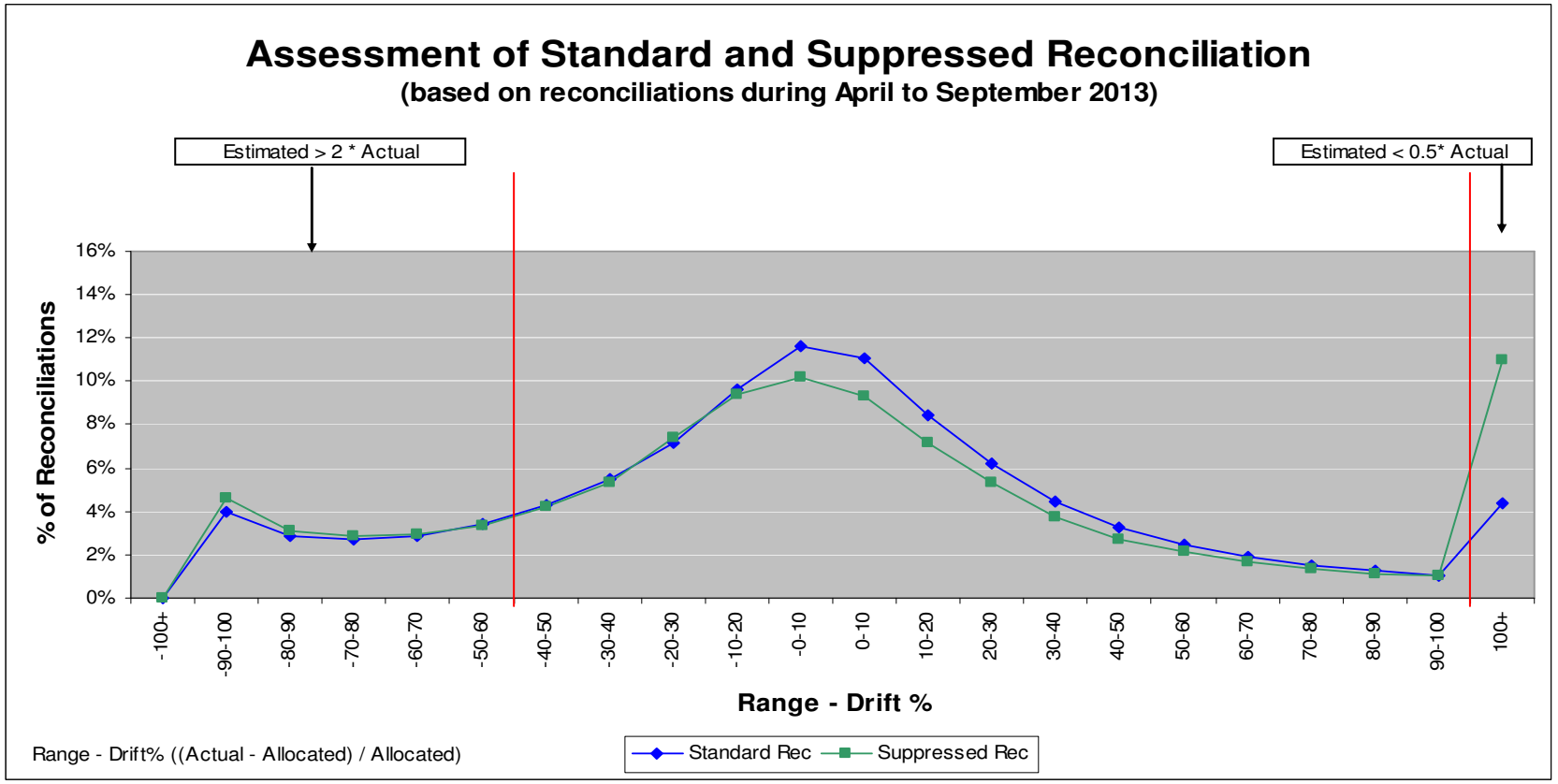
Algorithm Performance 2012/13: Strands 2 & 3

- Strand 1 (SF and WCF analysis) presented at Nov 2013 DESC
  - SF values generally closer to 1 (improvement compared to 11/12)
  - WCF deviation worsened over Winter 12/13 and generally improved during the Summer 12/13 (compared to 11/12)
- Strand 2: Reconciliation Variance Analysis
  - Compare allocated demand (derived from algorithms)
    with
  - Actual demand obtained from available reconciliation data
- Strand 3: NDM Sample Analysis
  - Compare the actual demand from the NDM sample data
    with
  - Allocated demand for the sample
- Supporting document with detailed explanation, including full examples

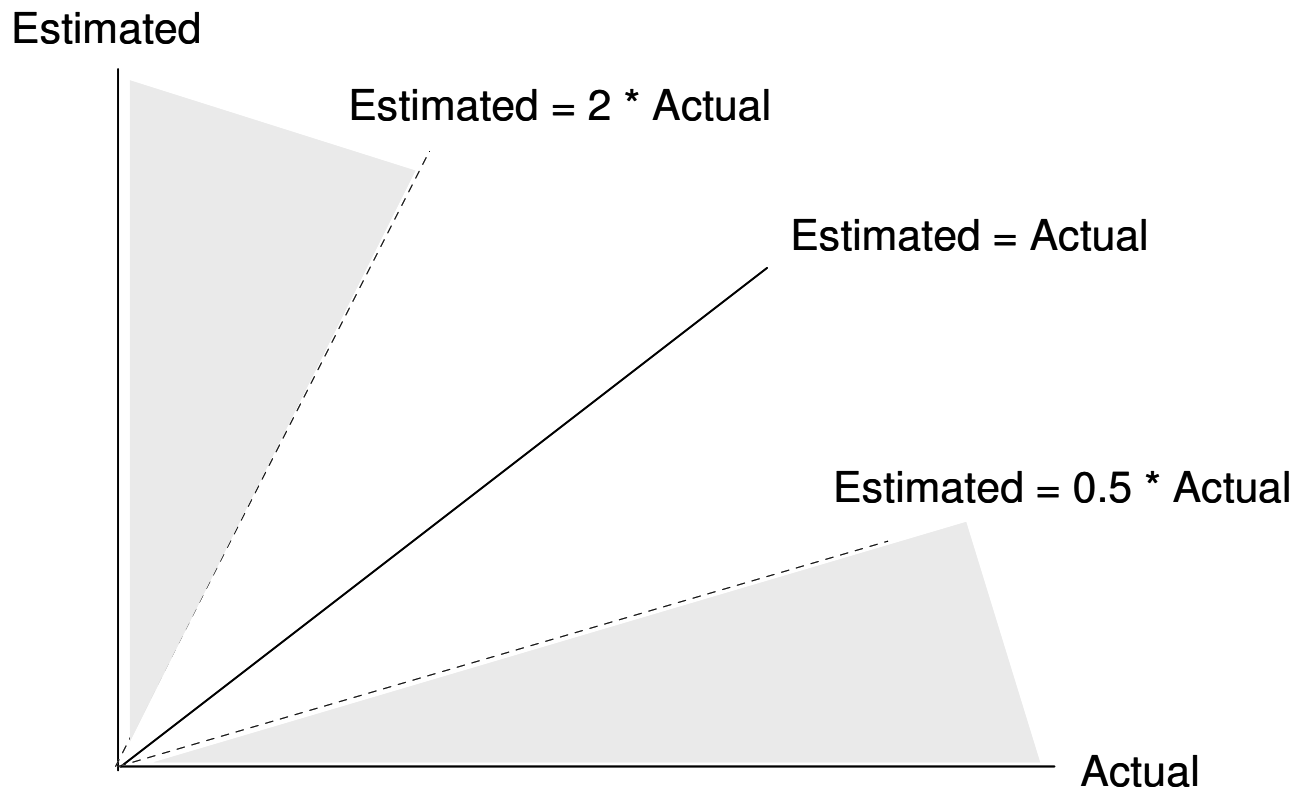
Strand 2: Reconciliation Variance Analysis

- 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 of 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'

Strand 2: RV Analysis
Assessment of Standard and Suppressed Rec

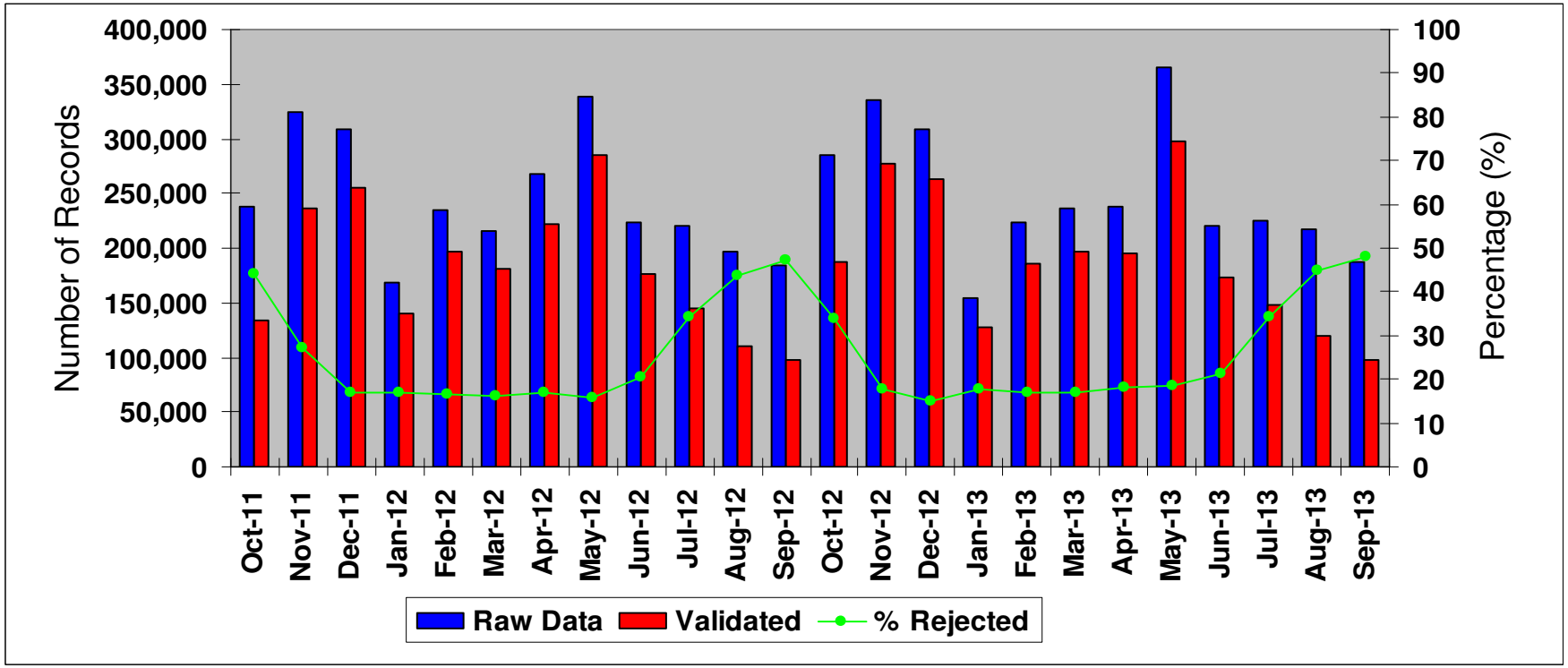


Strand 2: RV Analysis
Data Envelope



Strand 2: RV Analysis
Levels of Validation Fall Out

- **Rejection Criteria:** AQ <= 3kWh; Actual <= 0; Actual > 0 and Allocated > 2 x Actual; Actual > 0 and Allocated < 0.5 x Actual



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

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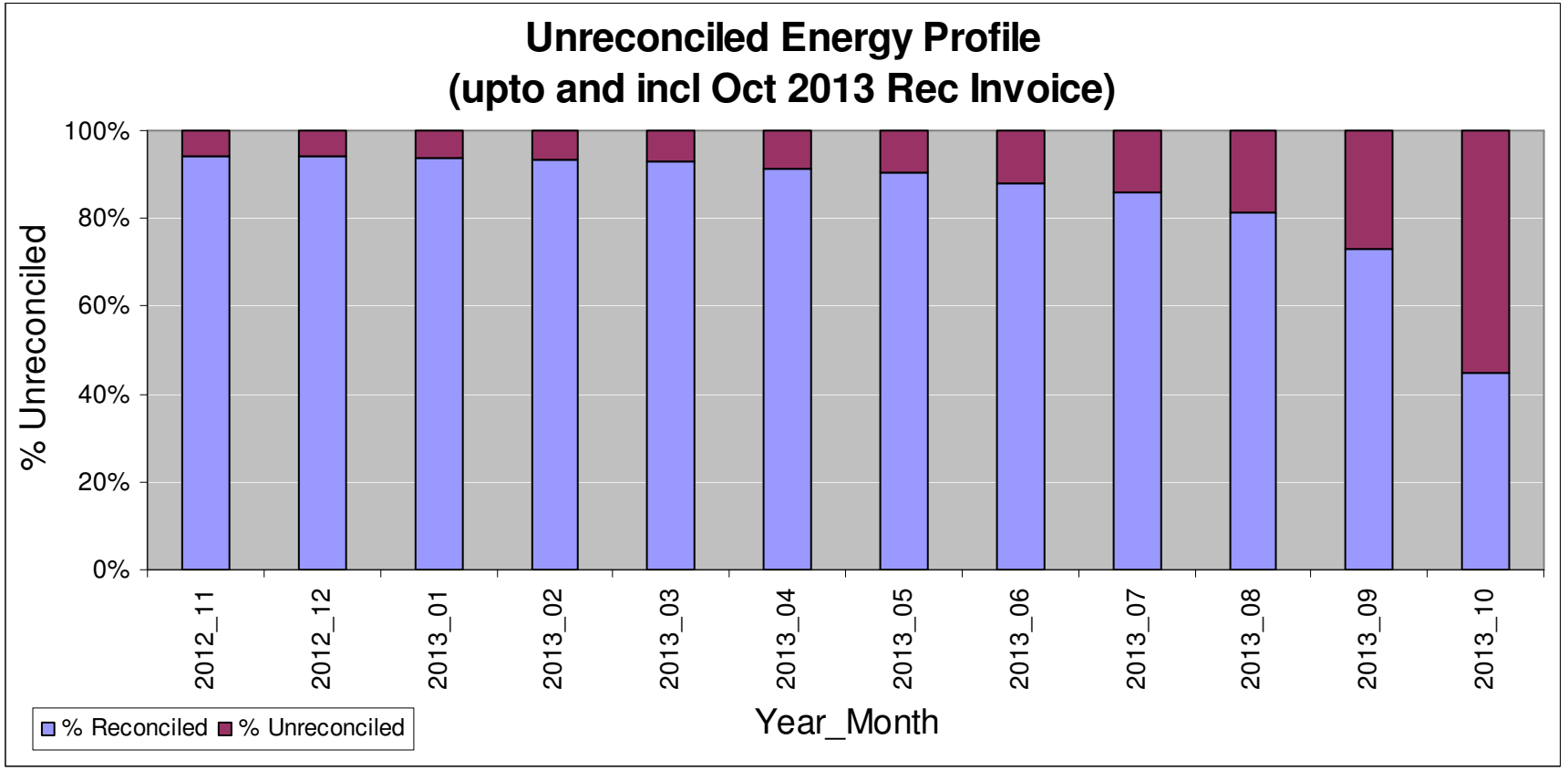
Strand 2: RV Analysis
Rejections – Approximate breakdown

Rejection category	Minimum .% (December 2012)	Maximum % (September 2013)
AQ <= 3 kWh pa	1.4%	1.3%
Actual < 0	0.9%	1.4%
Actual = 0	2.9%	9.6%
Actual > 0 and Allocated > 2 x Actual	6.5%	22.3%
Actual > 0 and Allocated < 0.5 x Actual	3.1%	13.4%

- Table shows the rejection category breakdown for:
  - December 2012 - which had the smallest rejection %
  - September 2013 – which had the largest rejection %

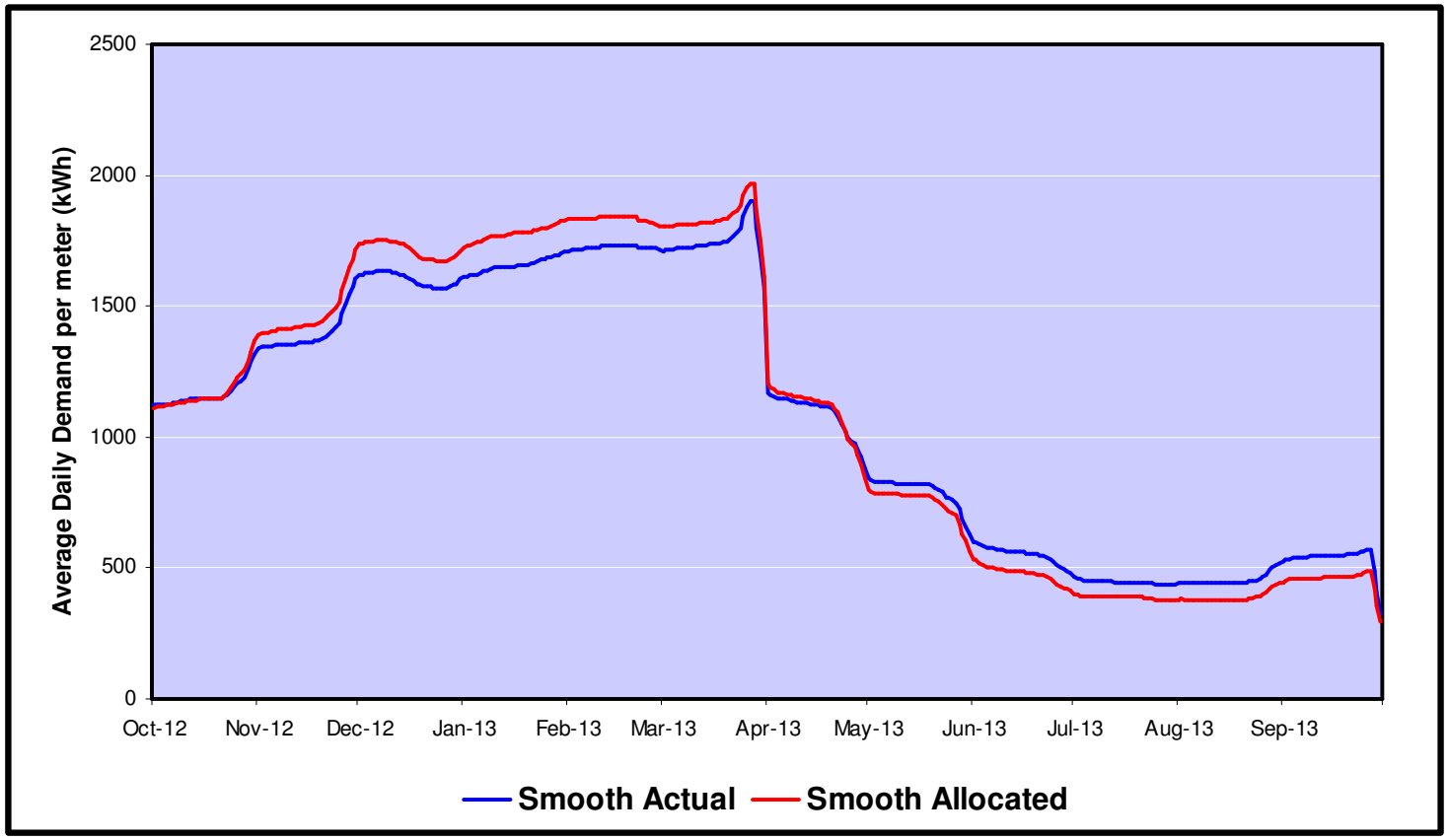
Strand 2: RV Analysis
Un-reconciled Energy Profile



Strand 2: RV Analysis Methodology

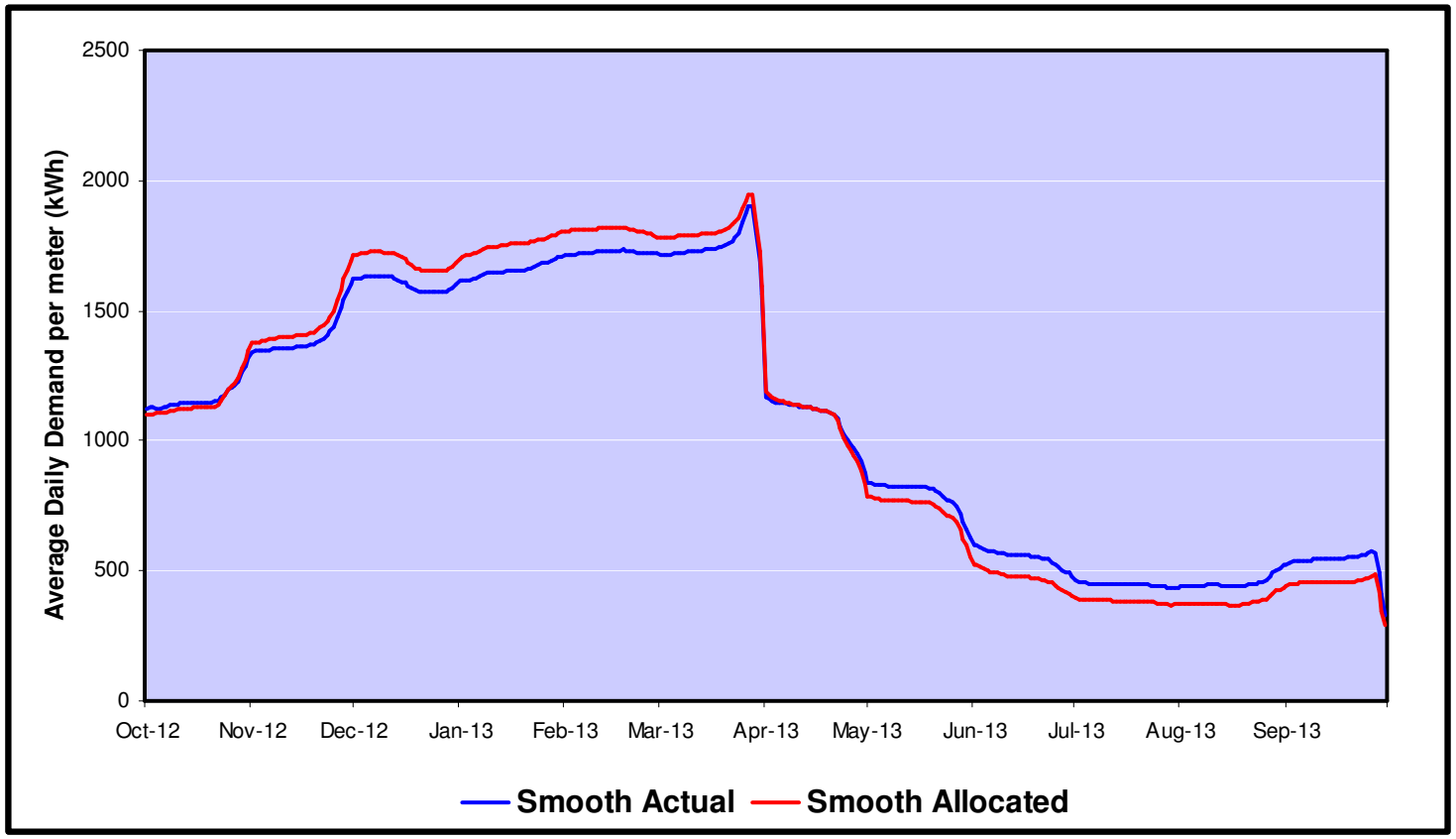
- Following removal of rejected reconciliations, for each meter point:
  - Reconciled energy is identified
  - Allocated Energy calculated
  - Values are then applied evenly to each day of the reconciliation period
  - Average for each of the meter points in the specific EUC is calculated
- Profile is '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

Strand 2: RV Analysis (Allocated to Actual) NW: Consumption Band 03 (Pre-Scaling)



- 1st chart highlights where scaling has not occurred and profile of demand through the year.
- Next slide shows after scaling...

Strand 2: RV Analysis (Allocated to Actual) NW: Consumption Band 03 (After Scaling)



- 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)

Strand 2: RV Analysis (Categorisation)

LDZ / EUC Profile & Error Levels – Gas Year 2012/13

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**	↑ Too Peaky	**10% Level**	⇑ Too Peaky
No Data (<2)			↓ Too Flat		⇓ Too Flat

- '% level' = average difference of allocation to actual over Winter and Summer differences (measures 'peakiness')

- 2012/13: 'Peaky' profiles 42%, 'Ok' 35%, Flat 5%, No data for analysis 18%
- 2011/12: 'Peaky' profiles 37%, 'Ok' 34%, Flat 10%, No data for analysis 19%
- 2010/11: 'Peaky' profiles 50%, 'Ok' 26%, Flat 5%, No data for analysis 19%

- Profiles overall for 2012/13 tend to be 'OK' or 'Peaky'

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Strand 2: RV Analysis Conclusions

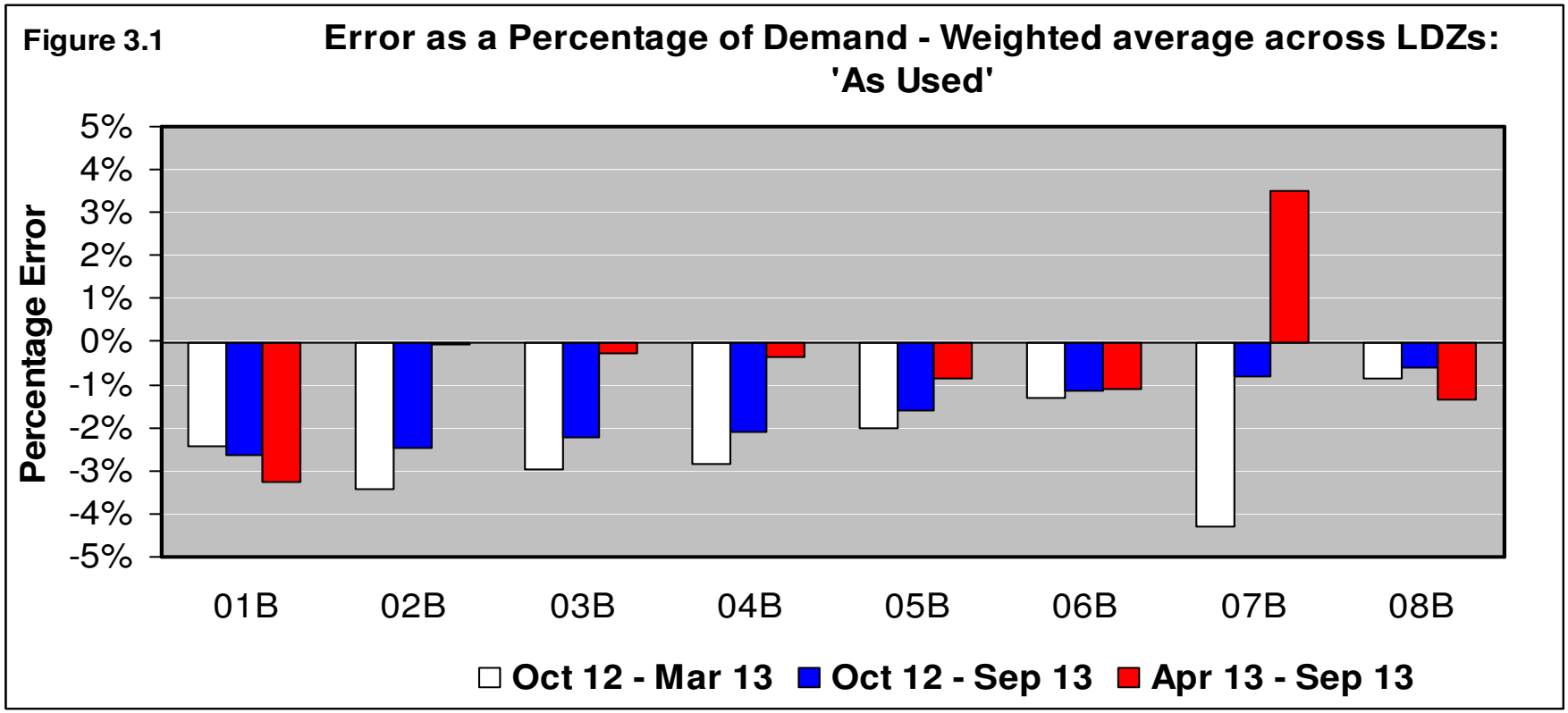
- RV analysis highlights a 'peaky' trend of:
  - Over Allocation - Winter
  - Under Allocation - Summer
- 2012/13 saw 42% of profiles defined as 'peaky' (37% in 2011/12)
  - Level of Reconciliation rejected similar to previous years
  - Available Reconciliation for analysis incomplete, particularly Bands 2/3 (non-monthly read meters)
- BUT – analysis not necessarily representative of population
  - Consider with SF and WCF analysis and NDM Sample data...

Strand 3: NDM Sample Analysis

- Using the actual NDM Sample consumption for 2012/13
  - Compare the % error of sample consumption against three models:
    - Allocated using 12/13 ALPs & DAFs, real system WCF and SF – (As Used)
    - Allocated using 12/13 ALPs & DAFs, EWCF and SF=1 – (Best Estimate '12)
    - Allocated using 13/14 ALPs & DAFs, 12/13 EWCF and SF=1 – (Best Estimate '13)
  - This is completed by EUC for all LDZs and also by month by LDZ
- Supporting document – detailed explanation with full examples

Strand 3: NDM Sample Analysis
Allocated Error As % of Actual Demand – 'As Used'

NOTE: 12/13 ALPs & DAFs; real system WCF and SF; NDM Sample derived AQs (not system AQs)



- Positive errors = Under allocation; Negative errors = Over allocation
- Over year: Negative errors across all consumption bands (indication that population AQs are marginally lower than sample derived AQs used in this analysis)
- 'As Used' model uses real system SFs which have taken population AQs into account
- 'As Used' model does not assess EUC profiles, however it can provide indicator of system AQ excess or deficit

Strand 3: NDM Sample Analysis
'As Used' Model – AQ Assessment

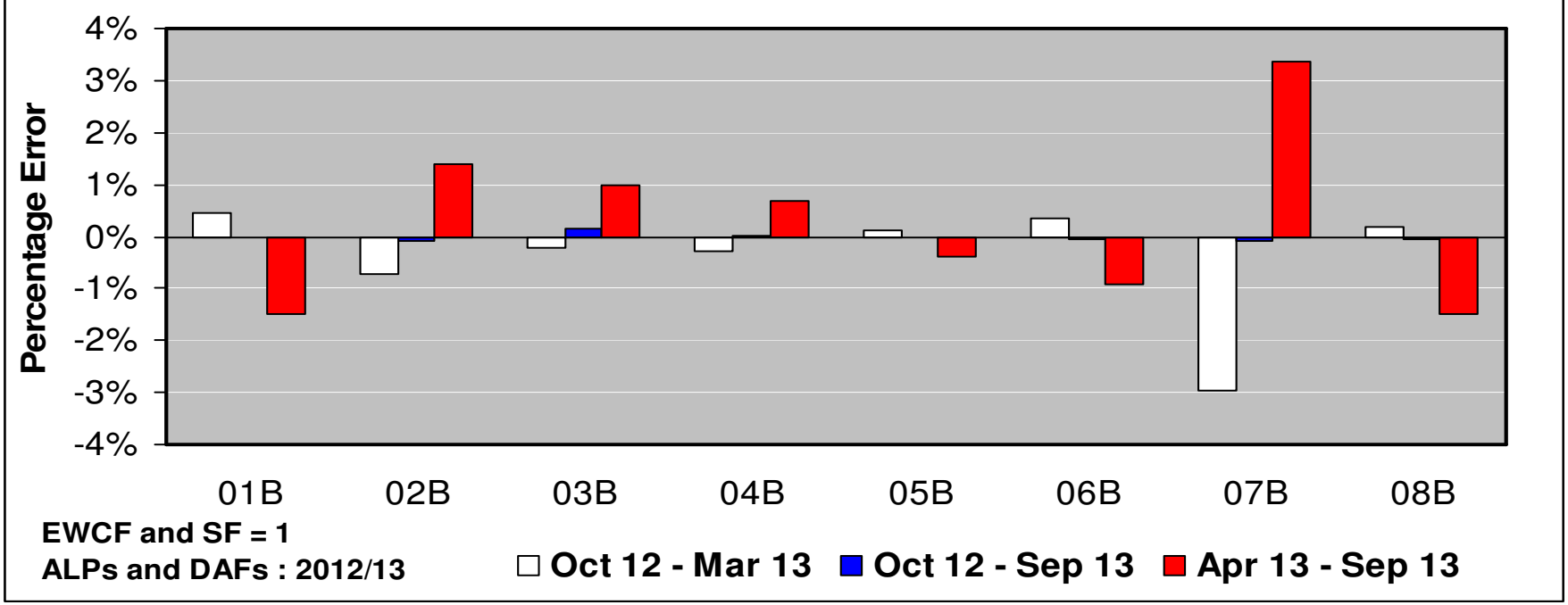
LDZ	Estimated AQ Excess (+) or Deficit (-) ('as used' analysis full year errors)	Observed NDM AQ Change in Gemini at start of gas year 2013/14 (-ve = reduction; +ve = increase)
SC	-0.1%	-1.9%
NO	-2.8%	0.1%
NW	-1.0%	-0.7%
NE	-1.0%	-1.3%
EM	0.1%	-0.7%
WM	-0.1%	-1.1%
WN	-	0.1%
WS	-1.6%	-0.4%
EA	-1.8%	-0.5%
NT	-2.2%	-0.5%
SE	-0.9%	-0.8%
SO	-0.9%	0.03%
SW	-1.4%	-0.2%
Overall	-1.1%	-0.7%

Strand 3: NDM Sample Analysis

Allocated Error As % of Actual Demand – 'Best Estimate 12'

NOTE: 12/13 ALPs & DAFs; EWCF and SF=1; NDM Sample derived AQs (not system AQs)

Figure 3.2



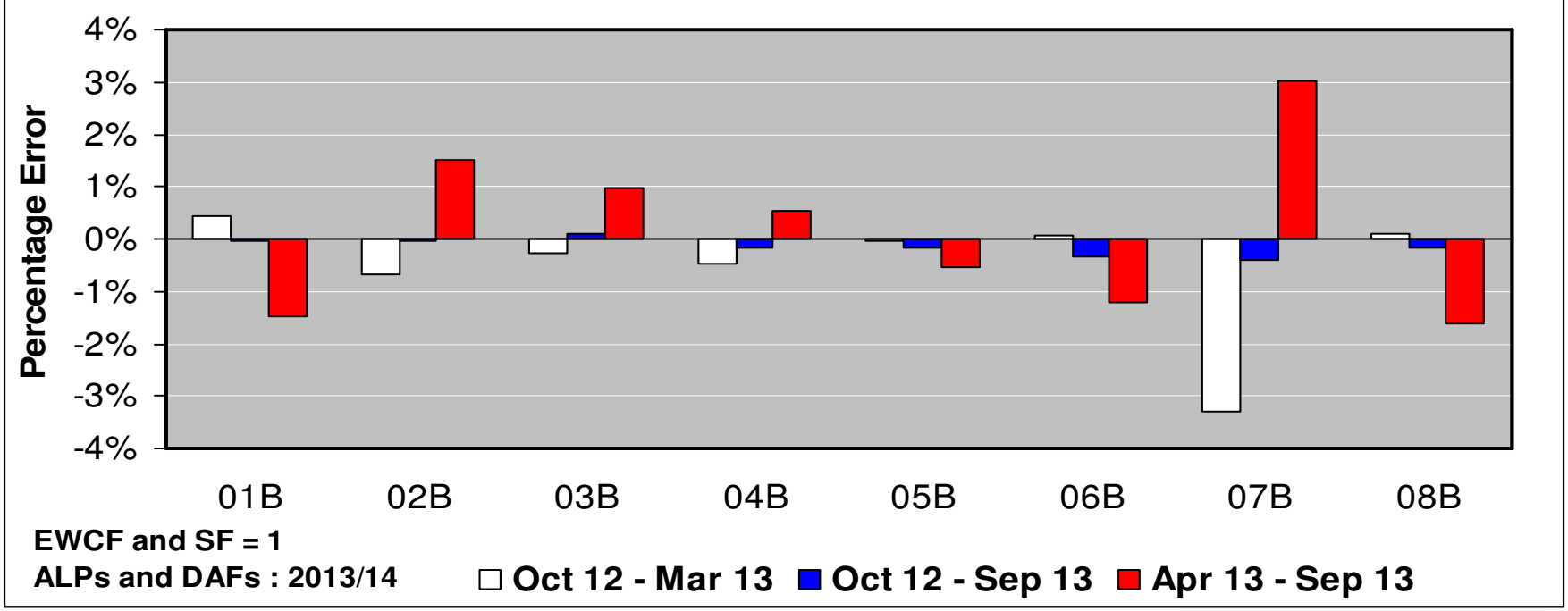
- Removes SF impact and use EWCF which avoids potential bias in WCF
- Positive errors = Under allocation; Negative errors = Over allocation
- Winter/Summer analysis indicates bands 01, 05, 06 & 08 little too flat and bands 02, 03, 04 & 07 little too peaky
- Over year: Little overall error in each band (Range -0.10% to +0.14% for all bands)

Strand 3: NDM Sample Analysis

Allocated Error As % of Actual Demand – 'Best Estimate 13'

NOTE: 13/14 ALPs & DAFs; EWCF and SF=1; NDM Sample derived AQs (not system AQs)

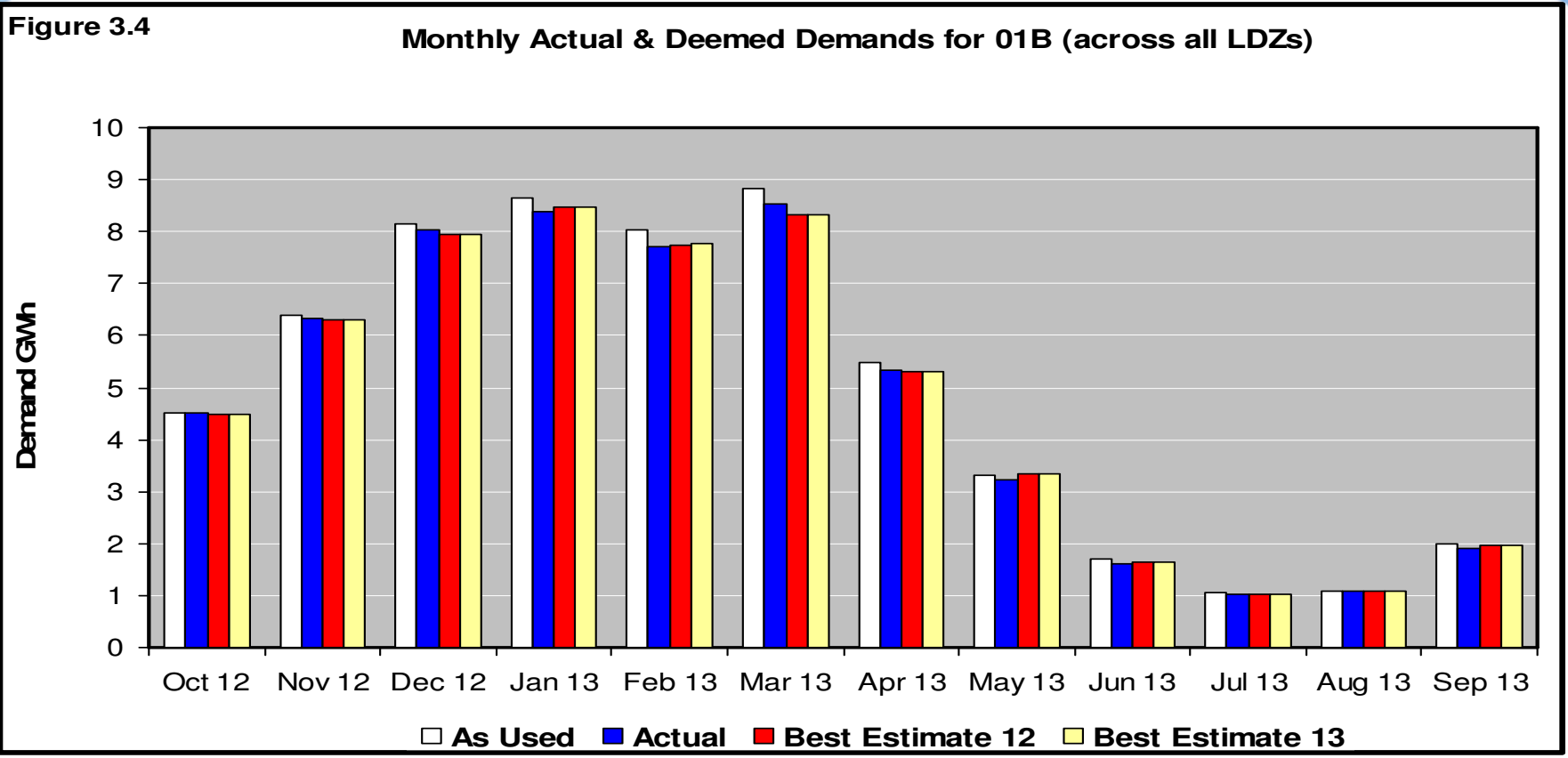
Figure 3.3



- ALPs and DAFs for 2013/14 applied to 2012/13 consumption data
- Should provide less error as ALPs and DAFs were derived from this consumption data
- Winter / Summer errors are slightly improved in bands 01 & 06. Slightly worse in 02, 03, 04, 05, 07 & 08
- Over whole year, on average, extent of error across all EUCs is slightly increased using 13/14 algorithms
- Monthly analysis also completed...

Strand 3: NDM Sample Analysis
Monthly Actual & Deemed Demand – 01B (All LDZs)

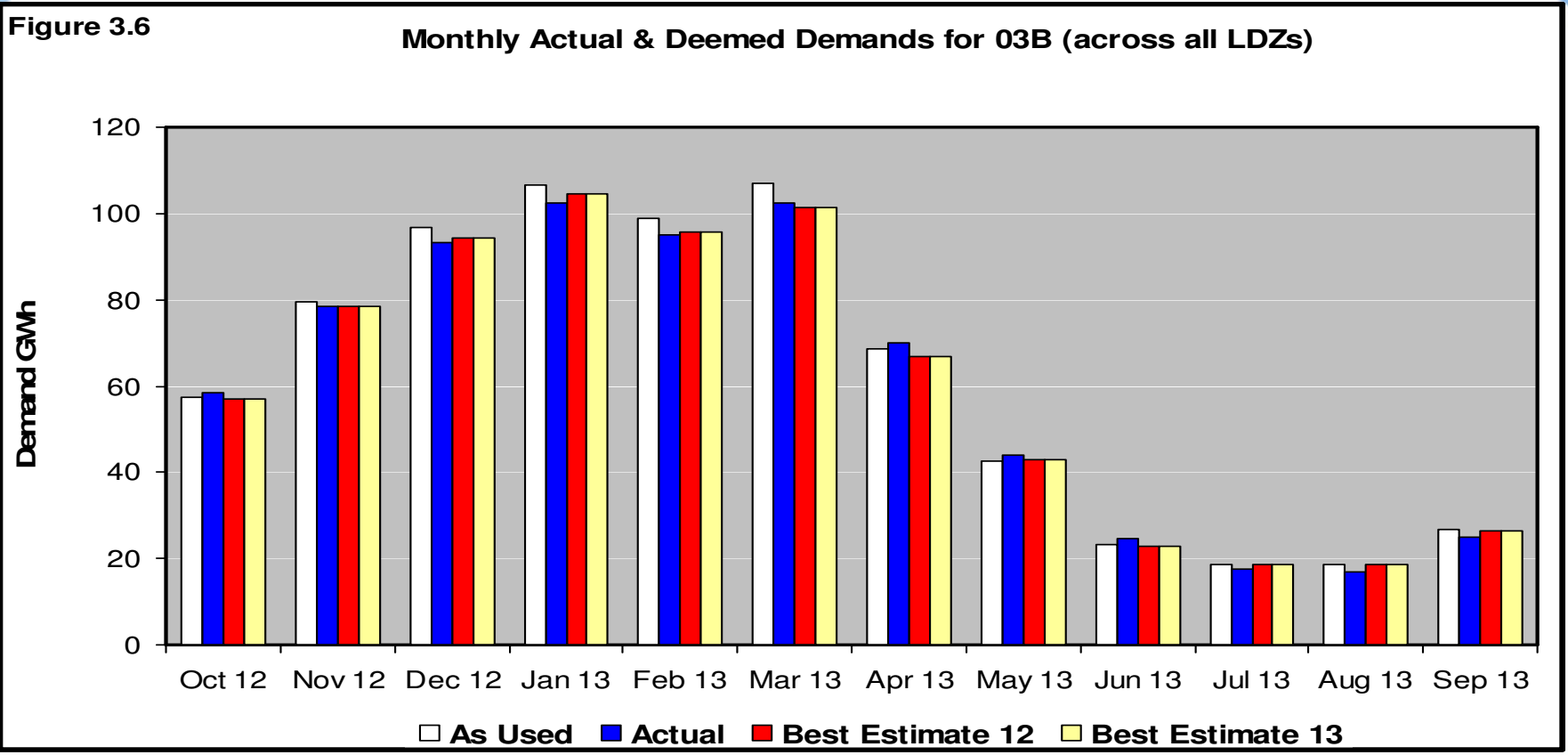
Figure 3.4



- 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 (except Jan & Feb) and summer over allocation (except Apr & Jul)
- Relevant to recall weather conditions in 12/13 when interpreting results
  - During Winter months October, February and March were colder than seasonal normal (March was particularly cold ranking 2nd coldest in last 50 years)
  - Summer months also generally colder than seasonal normal except for July which ranked 3rd warmest in last 50 years)

Strand 3: NDM Sample Analysis
Monthly Actual & Deemed Demand – 03B (All LDZs)

Figure 3.6



- Band 03B profile indicates:
  - Small winter under allocation in October, November and March.
  - Slight summer under from April to June (most evident in April) but also shows some over allocation in July, August and September.

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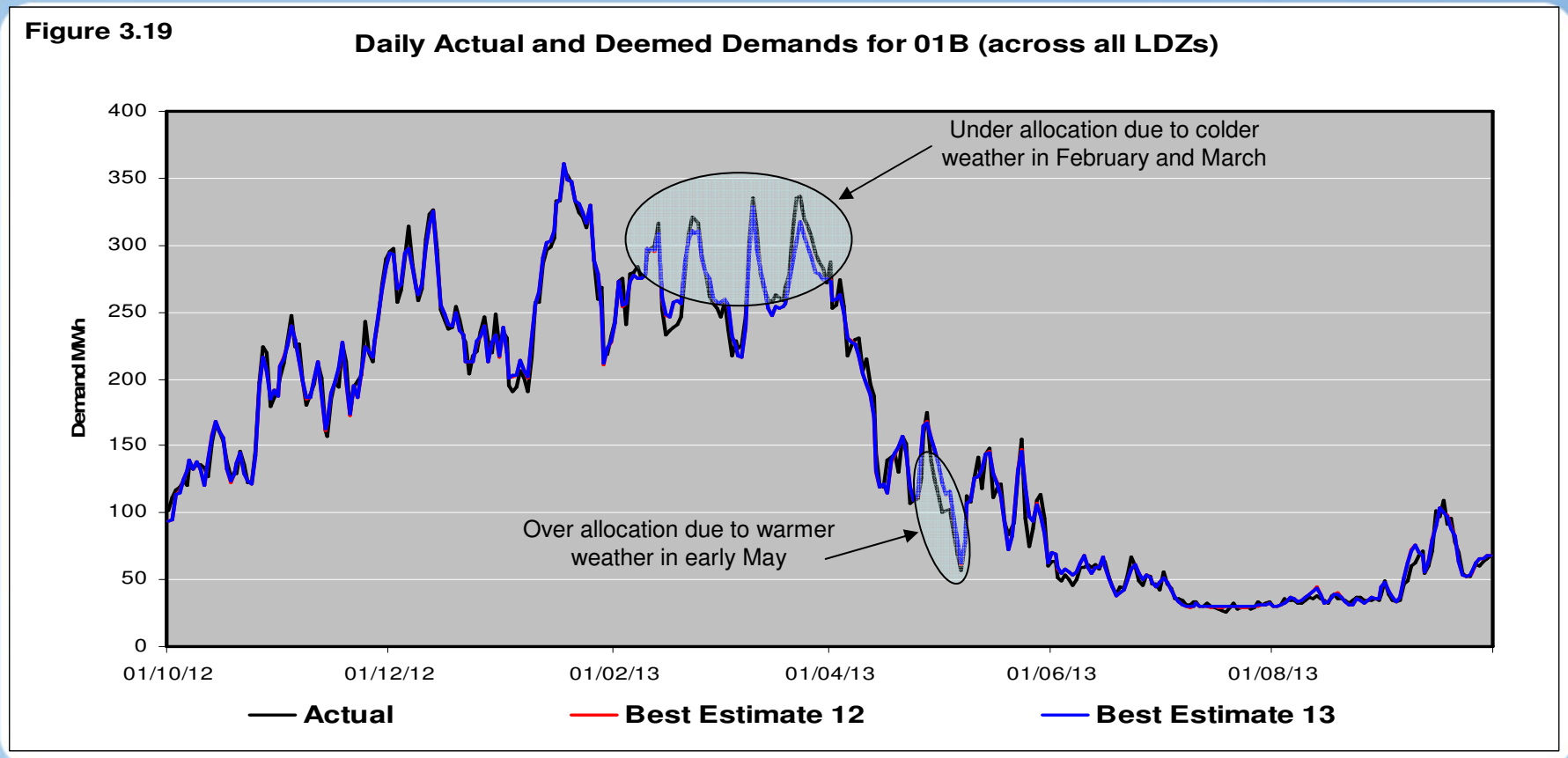
Strand 3: NDM Sample Analysis
Daily Actual & Deemed Demand – 01B (All LDZs)

Figure 3.19

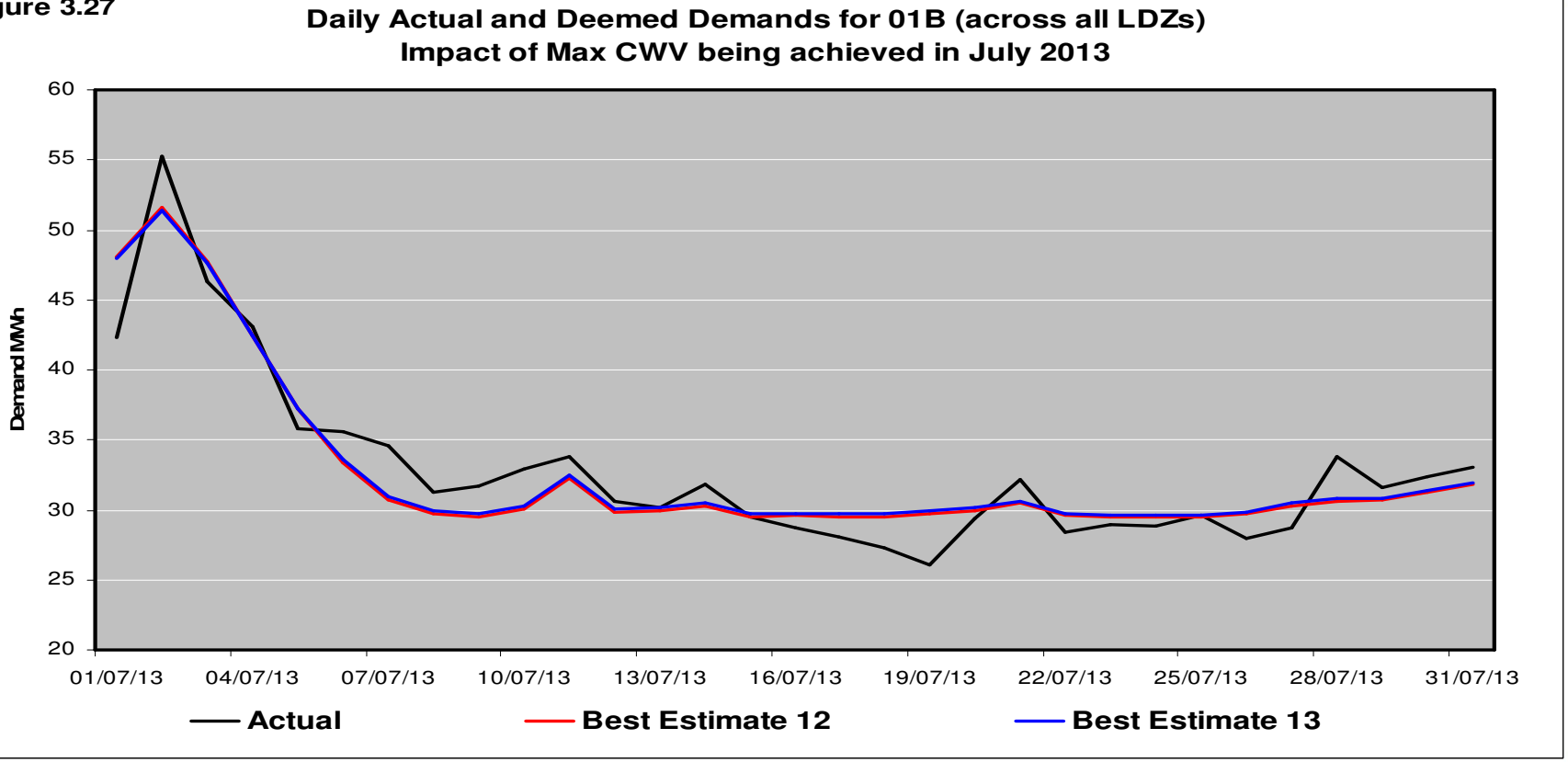


- The daily chart for Band 01 shows that allocated demand was generally close to actual demand. The most notable exception to this occurred during the particularly cold weather in February and March 2013 and the generally warmer period in early May 2013.

Strand 3: NDM Sample Analysis

Daily Actual & Deemed Demand – 01B (All LDZs) July 2013

Figure 3.27



- Overall, July 2013 ranked as the 3rd warmest July over the last 50 years
- Period of 6th to 24th was particularly warm (Met Office stating this was the UK's most notable heat wave since 2006)
- The maximum CWV value was achieved on most days in each LDZ during this period

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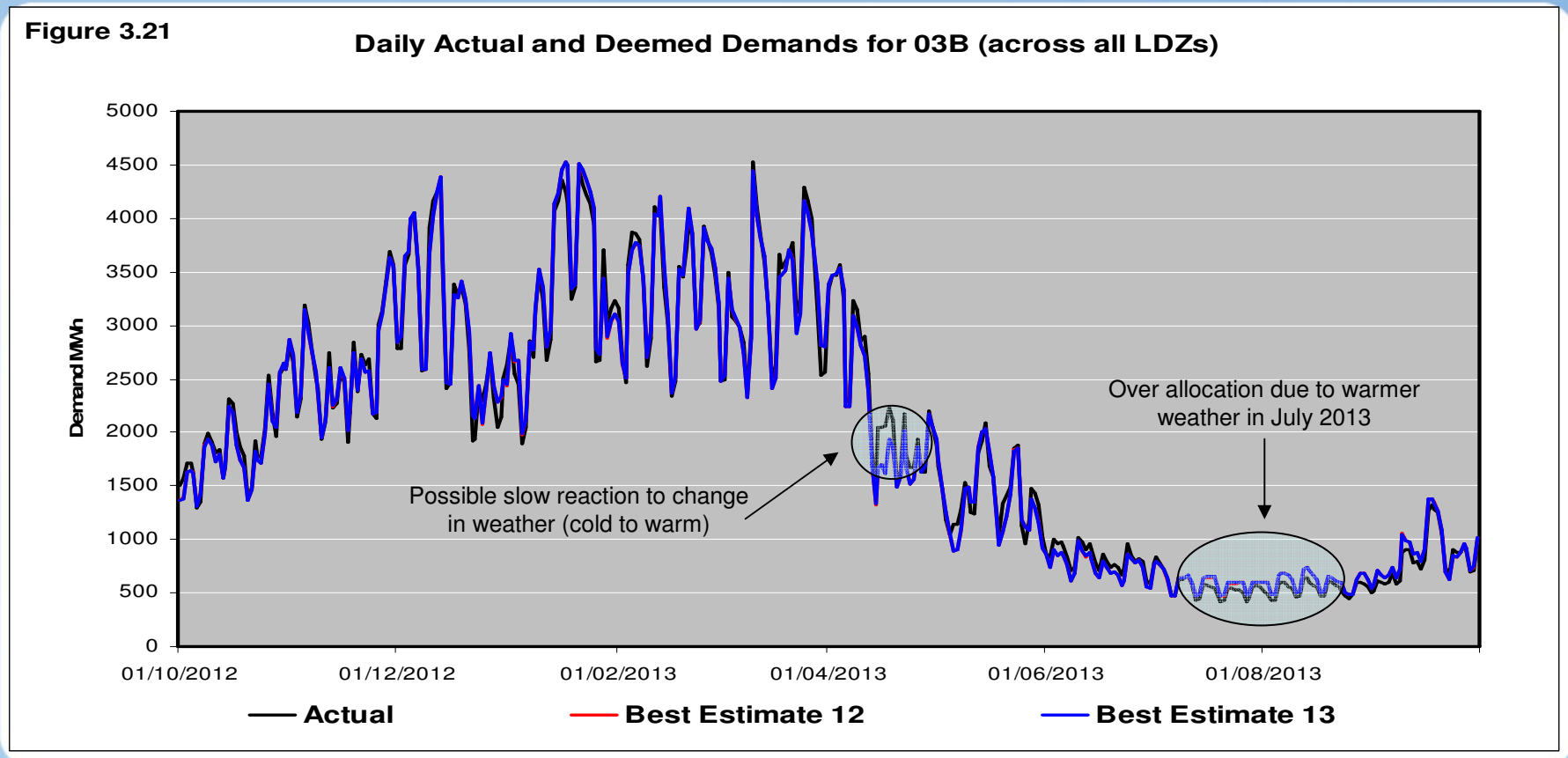
Strand 3: NDM Sample Analysis
Daily Actual & Deemed Demand – 03B (All LDZs)

Figure 3.21



- The daily chart for Band 03 shows that allocated demand was generally close to actual demand. The most notable exception to this occurred around the shoulder period in mid April 2013 and the particularly warmer weather during July 2013.

Strands 2 & 3: (RV Analysis & NDM Sample Analysis) Summary

- The “best estimate 12” & “best estimate 13” analyses suggest:
  - For bands 02, 03, 04 & 07; over allocation (-ve errors) in the winter and under allocation (+ve errors) in the summer. Profile too peaky.
  - For bands 01, 05, 06 & 08; under allocation (+ve errors) in the winter and over allocation (-ve errors) in the summer. Profile too flat.

- The RV analysis indicated profiles that were:
  - too peaky in most LDZs in bands 02 & 03 (overall too peaky in bands 02 & 03, at 5% level)
  - good in most LDZs in bands 04 & 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 slightly too peaky, below 5% level in band 07 and overall too peaky in bands 06 & 08, at 5% level)

Strands 2 & 3: (RV Analysis & NDM Sample Analysis) Conclusions

- Limited – 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
  - 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
- Full explanatory document on Joint Office website:
  - 'Algorithm Performance Strand 2 & 3 Evaluation 2012-13.pdf'