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DESC: NDM Algorithm Performance (Gas Year 2013/14)

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

11th February 2015

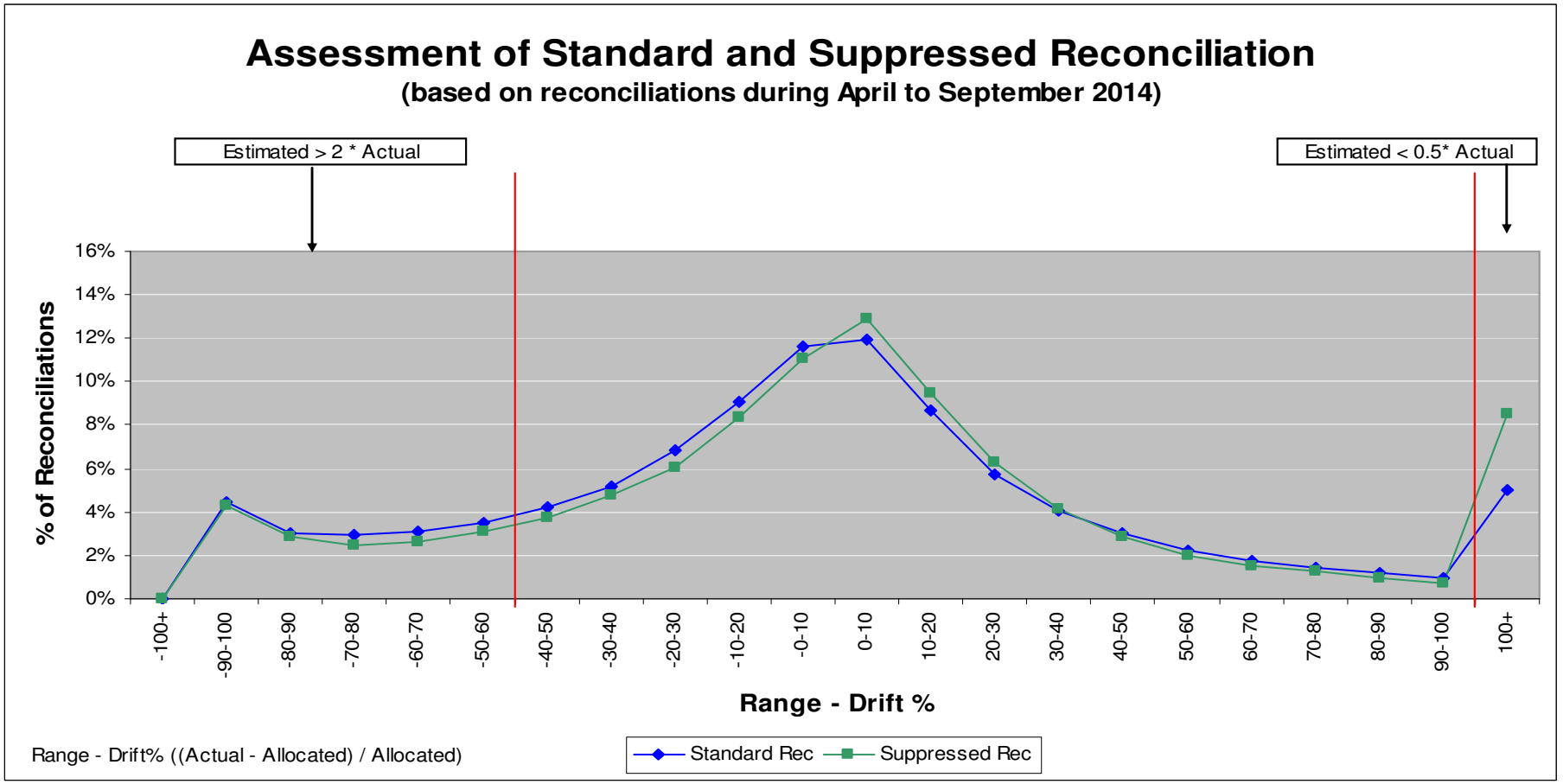
Algorithm Performance 2013/14: Strands 2 & 3

- Strand 1 (SF and WCF analysis) presented at Nov 2014 DESC
  - SF values marginally further from 1 (slightly worse compared to 12/13)
  - WCF deviation closer to zero over Winter 13/14 and during Summer 13/14 (compared to 12/13)
- 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

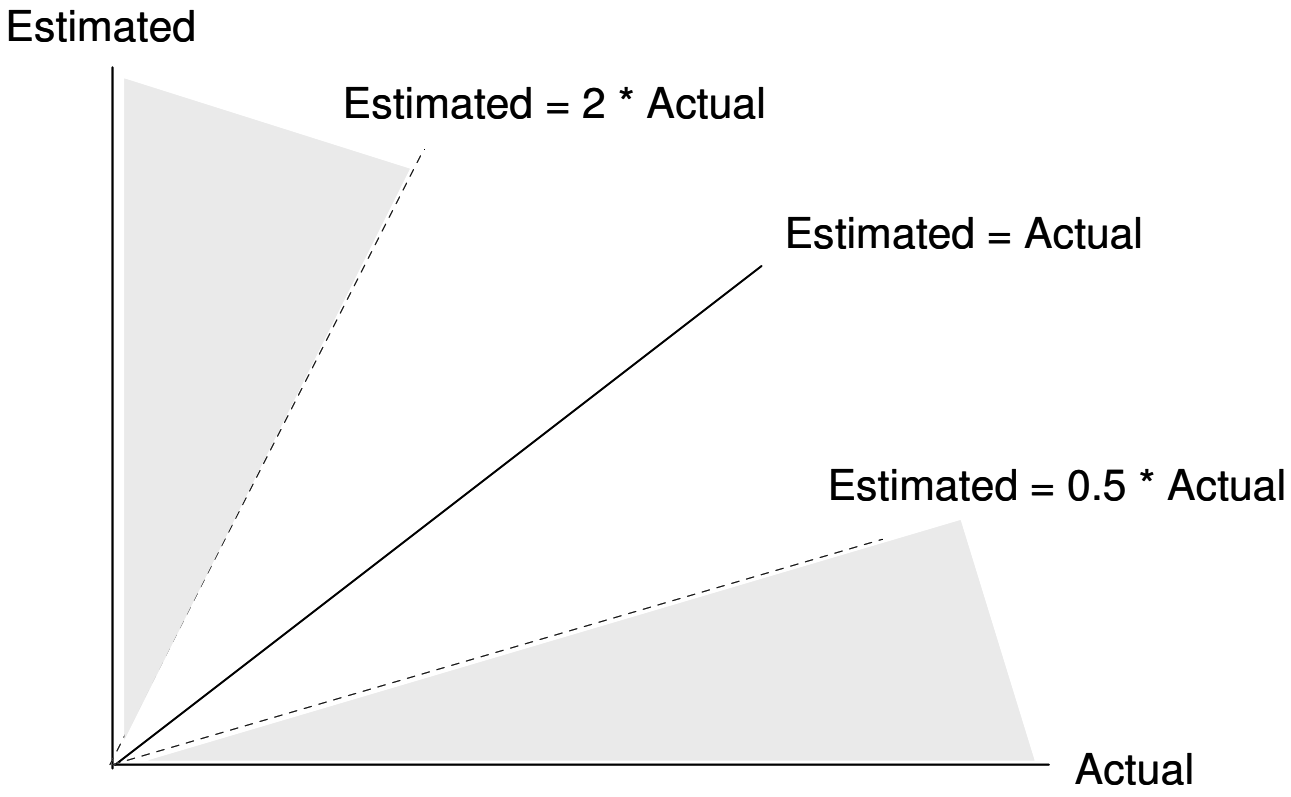
Strand 2: Reconciliation Variance Analysis

- 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

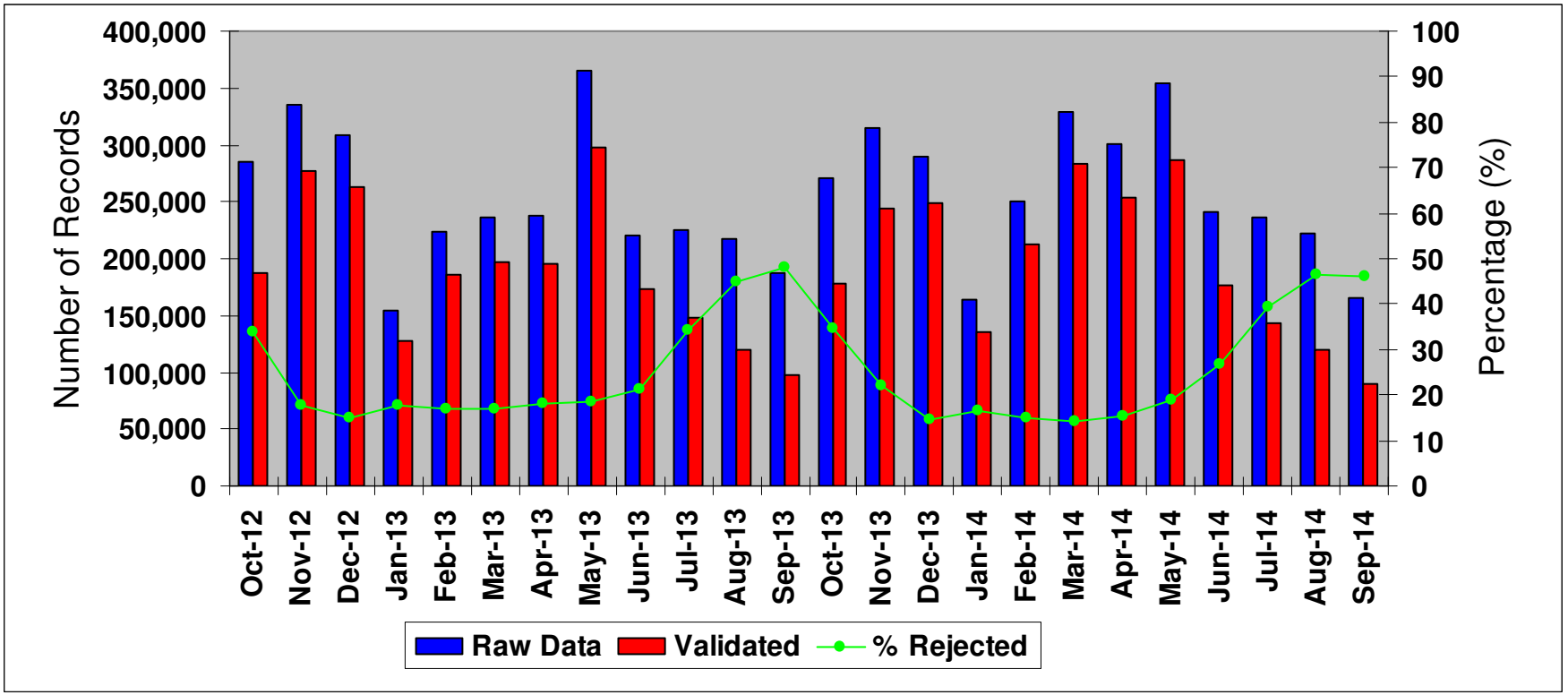


Strand 2: RV Analysis
Data Envelope



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

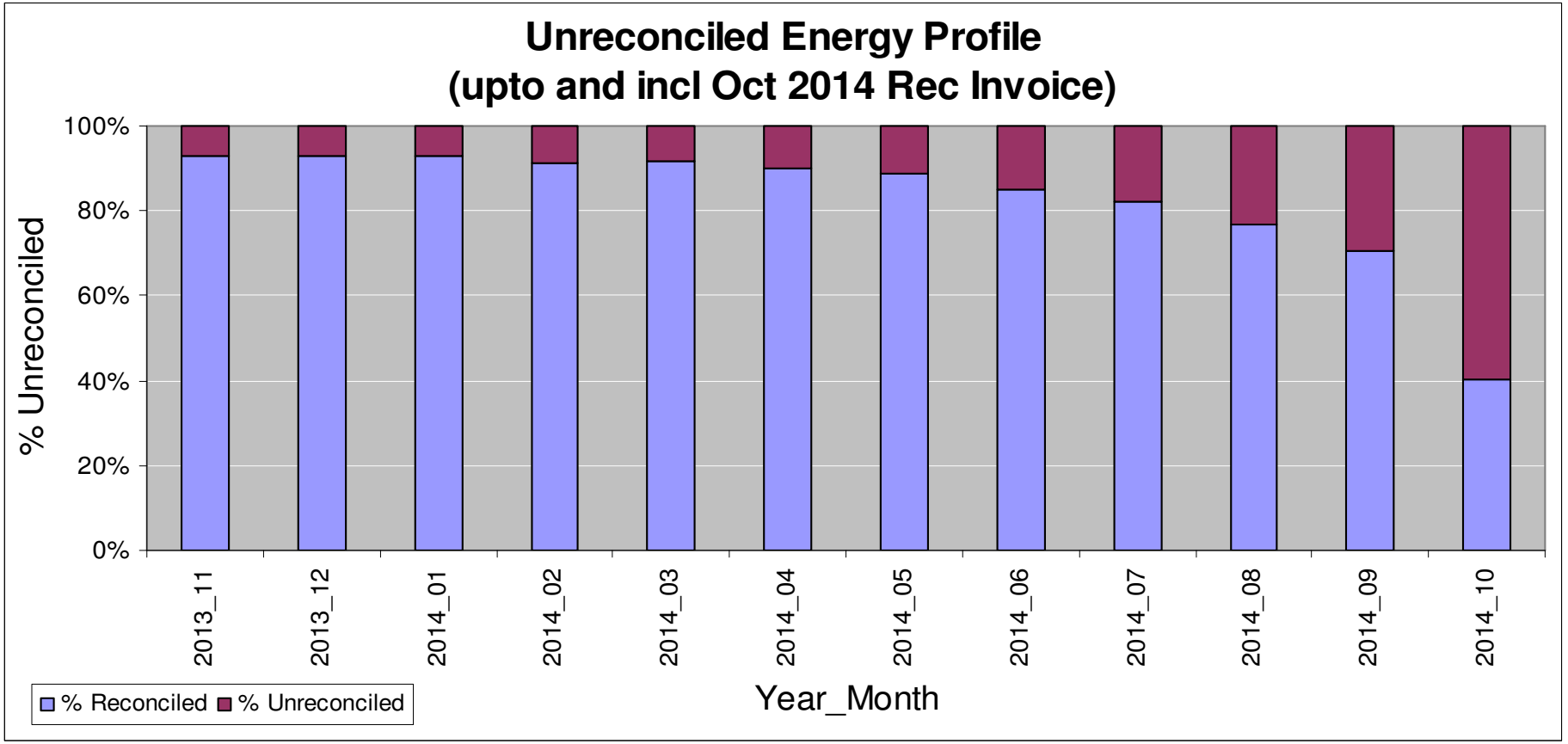


- Rejection rates higher in the summer due to smaller consumptions thereby resulting in greater % differences
- Profiles consistent with previous years and post-validation numbers good

Strand 2: RV Analysis
Rejections – Approximate breakdown

Rejection category	Minimum .% (March 2014)	Maximum % (August 2014)
AQ <= 3 kWh pa	1.4%	1.3%
Actual < 0	0.9%	1.7%
Actual = 0	2.8%	8.9%
Actual > 0 and Allocated > 2 x Actual	6.0%	22.1%
Actual > 0 and Allocated < 0.5 x Actual	3.0%	12.3%

Strand 2: RV Analysis
Un-reconciled Energy Profile



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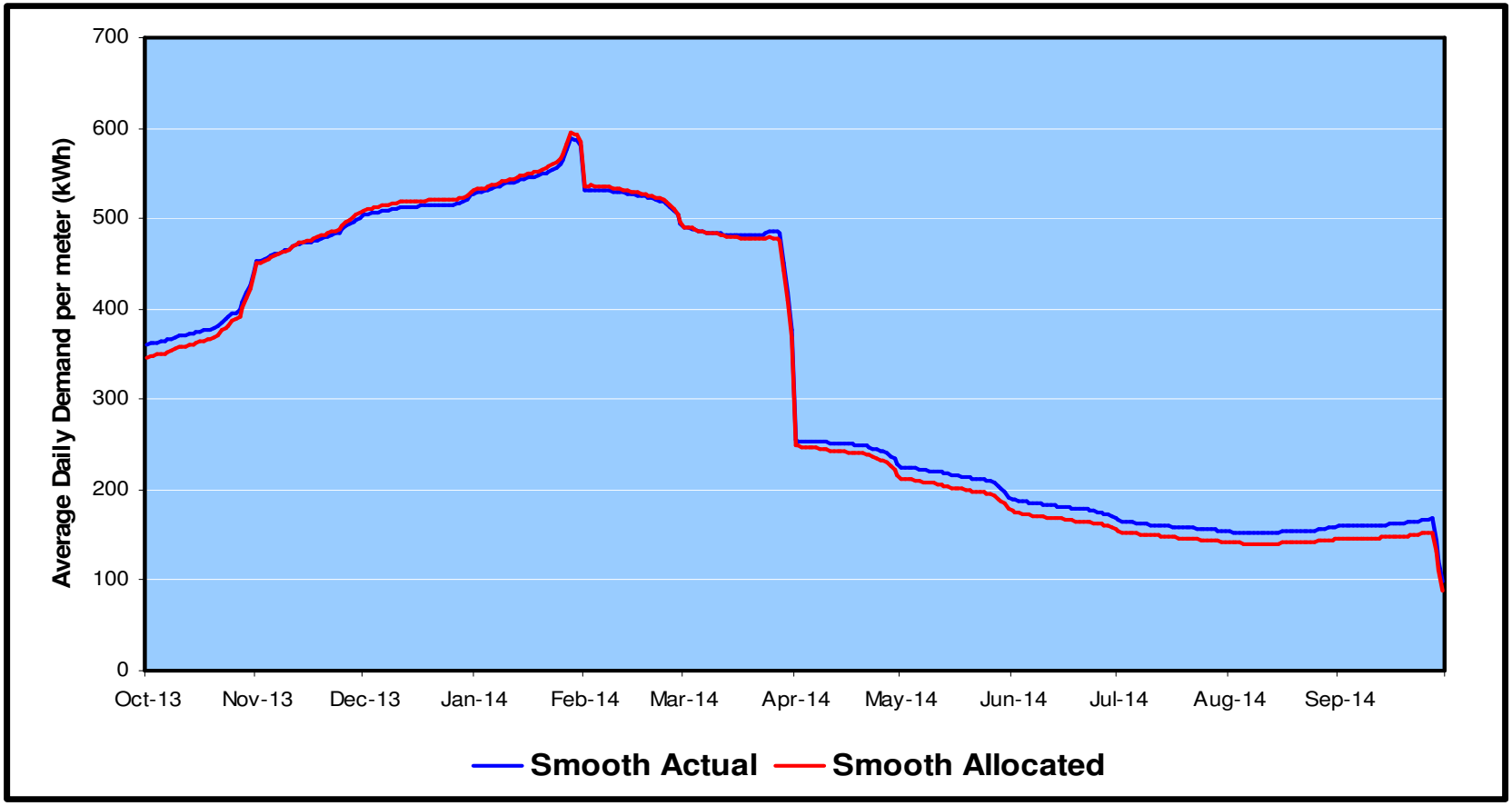
Strand 2: RV Analysis Methodology

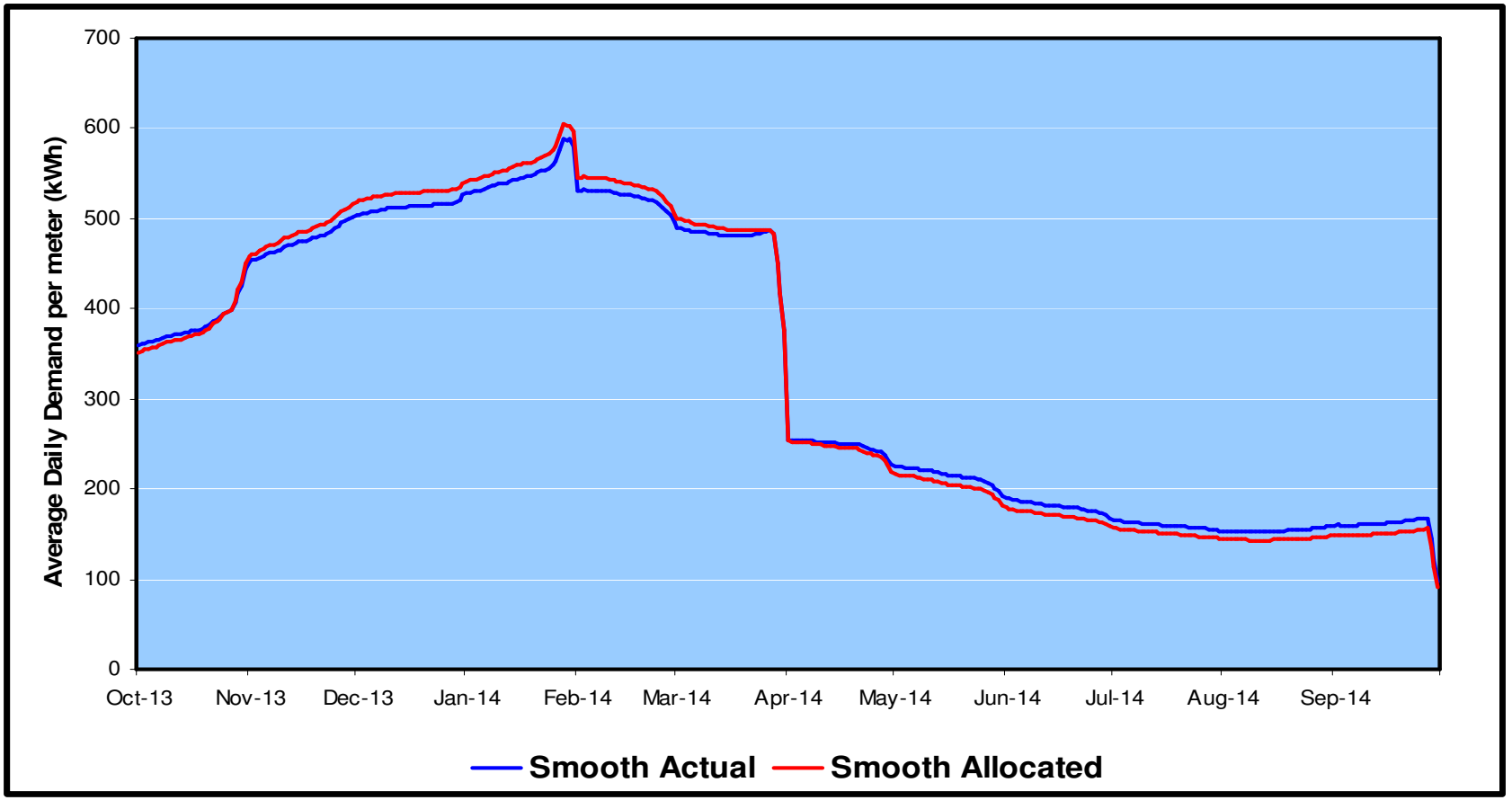
- Following removal of rejected reconciliations, for each meter point:
  - Reconciled energy is identified
  - Allocated Energy calculated
  - Values are then applied evenly to each day of the reconciliation period
  - Average for each of the meter points in the specific EUC is calculated
- Profile is '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)
EA: Consumption Band 02 (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) EA: Consumption Band 02 (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 (the predominant profile)

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Strand 2: RV Analysis (Categorisation)
LDZ / EUC Profile & Error Levels – Gas Year 2013/14

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’)

- 2013/14: ‘Peaky’ profiles 49%, ‘Ok’ 31%, Flat 4%, No data for analysis 16%
- 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%

- Profiles overall for 2013/14 tend to be ‘OK’ or ‘Peaky’

Strand 2: RV Analysis Conclusions

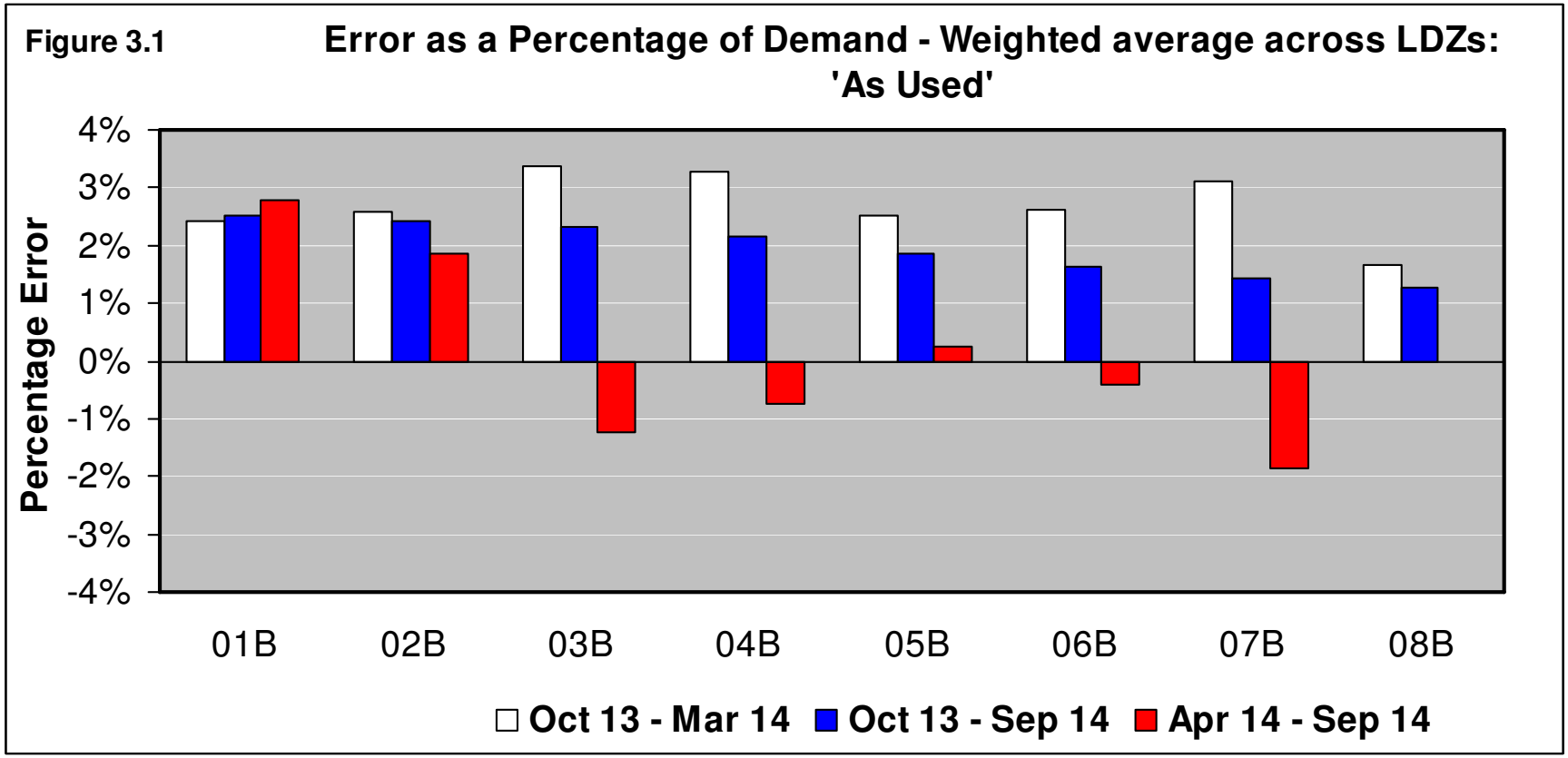
- RV analysis highlights a ‘peaky’ trend of:
  - Over Allocation - Winter
  - Under Allocation - Summer
- 2013/14 saw 49% of profiles defined as ‘peaky’ (42% in 2012/13)
  - Level of Reconciliation rejected similar to previous years
  - Available Reconciliation for analysis incomplete, particularly Bands 2/3 (non-monthly read meters)
- However - 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 2013/14
  - Compare the % error of sample consumption against three models:
    - Allocated using 13/14 ALPs & DAFs, real system WCF and SF - (As Used)
    - Allocated using 13/14 ALPs & DAFs, EWCF and SF=1 - (Best Estimate '13)
    - Allocated using 14/15 ALPs & DAFs, 13/14 EWCF and SF=1 - (Best Estimate '14)
  - 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: 13/14 ALPs & DAFs; real system WCF and SF; NDM Sample derived AQs (not system AQs)



- Positive errors = Under allocation; Negative errors = Over allocation
- Over year: Positive errors across all consumption bands (indicate population AQs too high)
- '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

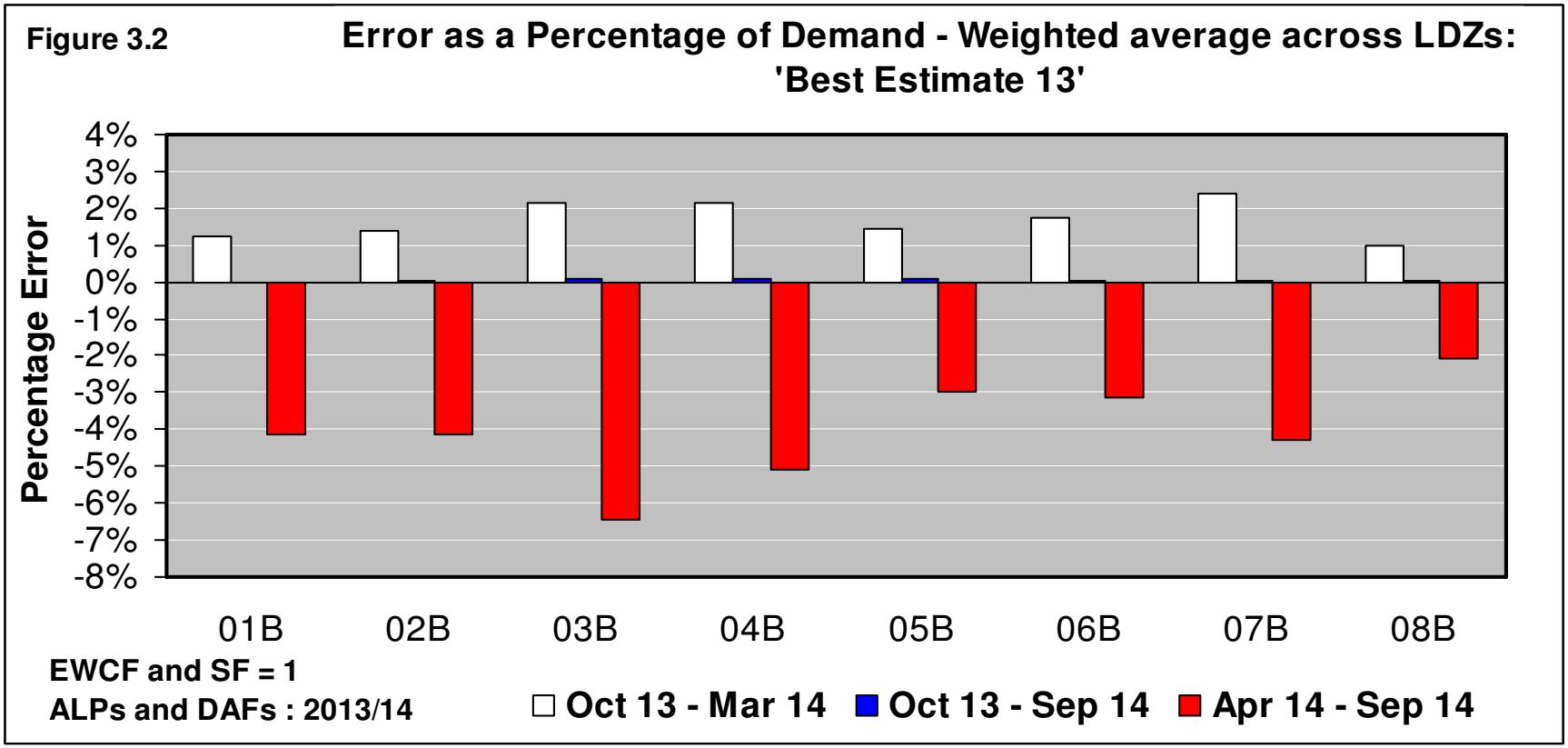
LDZ	Estimated AQ Excess (+) or Deficit (-) ('as used' analysis full year errors)	Observed AQ Reductions in Gemini at start of gas year 2014/15
SC	1.9%	-3.2%
NO	0.8%	-1.8%
NW	2.1%	-3.0%
NE	1.3%	-3.3%
EM	1.1%	-2.4%
WM	1.7%	-3.0%
WN	-	-3.3%
WS	1.8%	-2.9%
EA	1.6%	-2.1%
NT	0.5%	-1.5%
SE	1.6%	-2.0%
SO	2.3%	-3.0%
SW	2.0%	-1.3%
Overall	1.6%	-2.5%

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 3.2

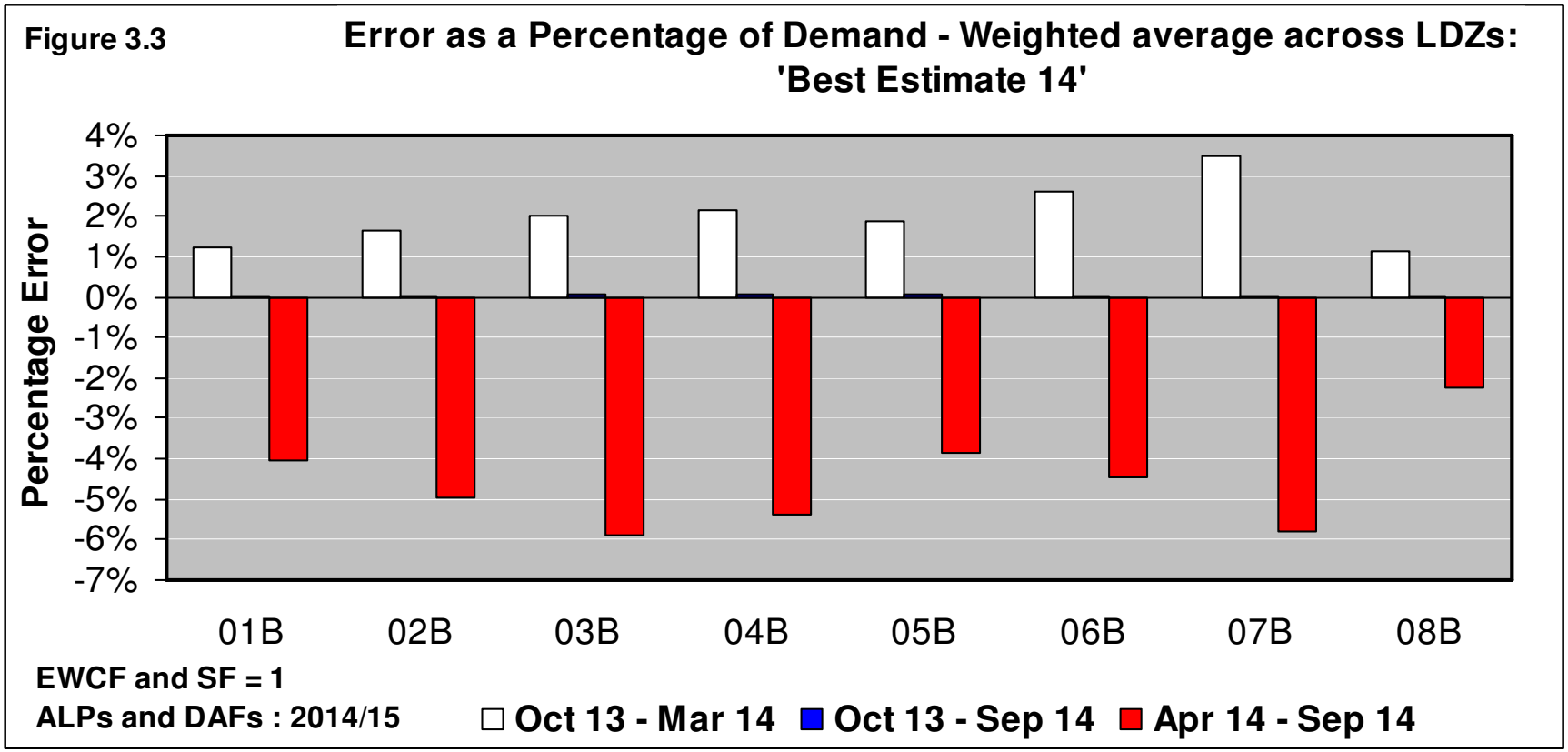


- Removes SF impact and uses EWCF which avoids potential bias in WCF
- Positive errors = Under allocation; Negative errors = Over allocation
- Winter/Summer analysis indicates that for all bands (01 to 08) profiles were too flat
- Over year: Very little overall error in each band (Range 0.00% to +0.10% for all bands)

Strand 3: NDM Sample Analysis

Allocated Error As % of Actual Demand – 'Best Estimate 14'

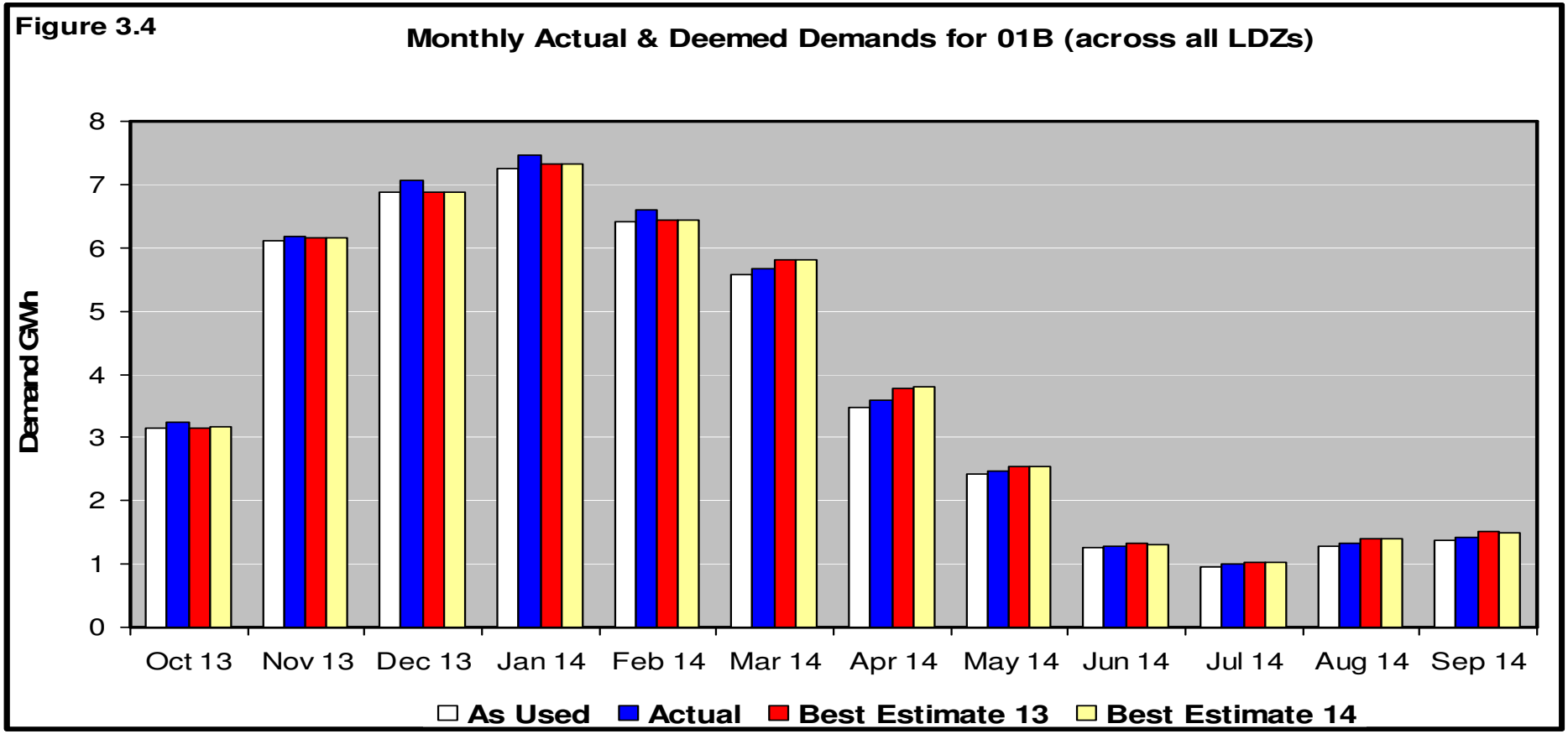
NOTE: 14/15 ALPs & DAFs; 13/14 EWCF and SF=1; NDM Sample derived AQs (not system AQs)



- ALPs and DAFs for 2014/15 applied to 2013/14 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 & 03 and slightly worse in 02, 04, 05, 06, 07 & 08
- Over whole year, on average, extent of error across all EUCs is slightly reduced using 13/14 algorithms
- Monthly analysis also completed...

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

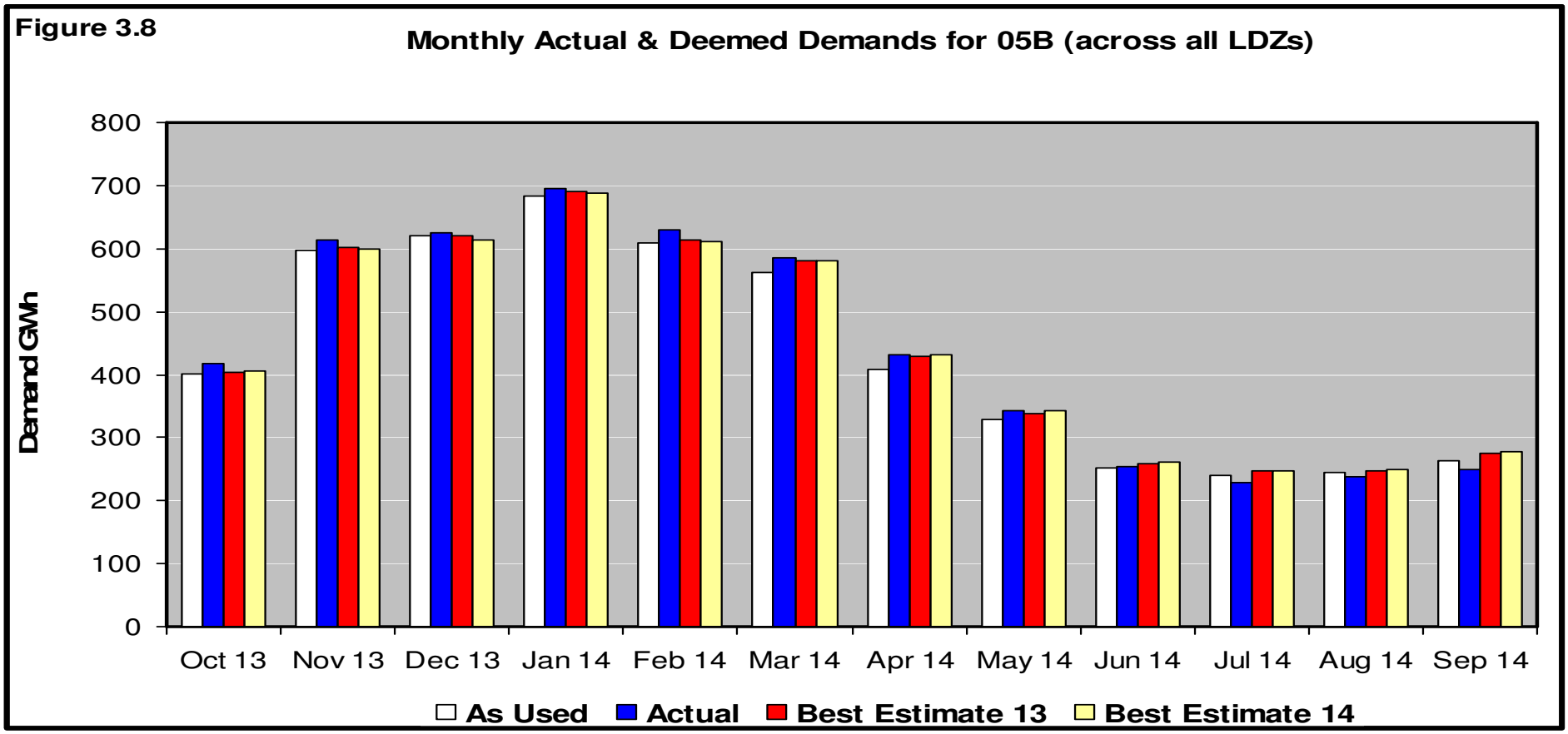
Figure 3.4



- 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 March 2014) and summer over allocation
- Relevant to recall weather conditions in 13/14 when interpreting results
  - During Winter months, November was colder than seasonal normal and March was warmer than seasonal normal (ranking 7th warmest in last 50 years)
  - Summer months were fairly average except for April which ranked 3rd warmest in last 50 years

Strand 3: NDM Sample Analysis
Monthly Actual & Deemed Demand – 05B (All LDZs)

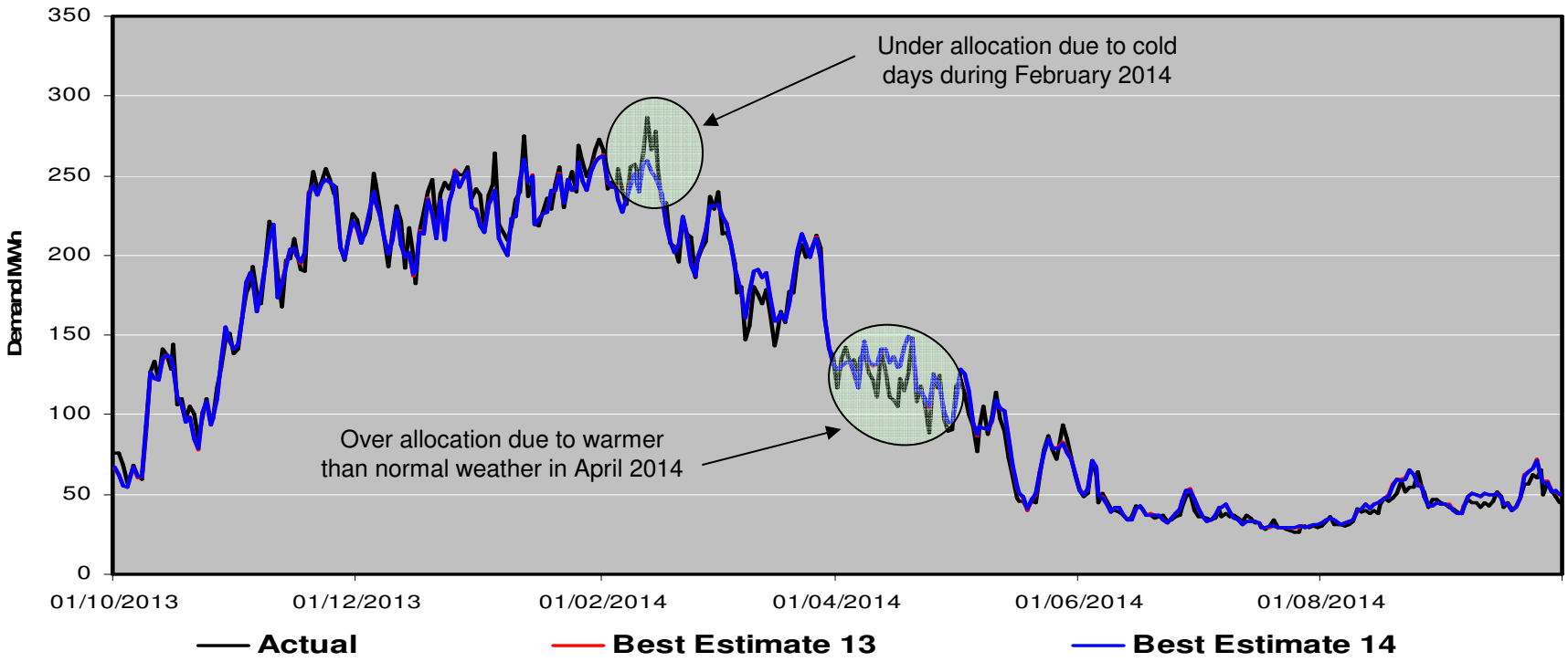
Figure 3.8



- Band 05B profile indicates:
  - Under allocation in all six winter months
  - Slight summer under allocation in April and May but also shows over allocation in June, July, August and September

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

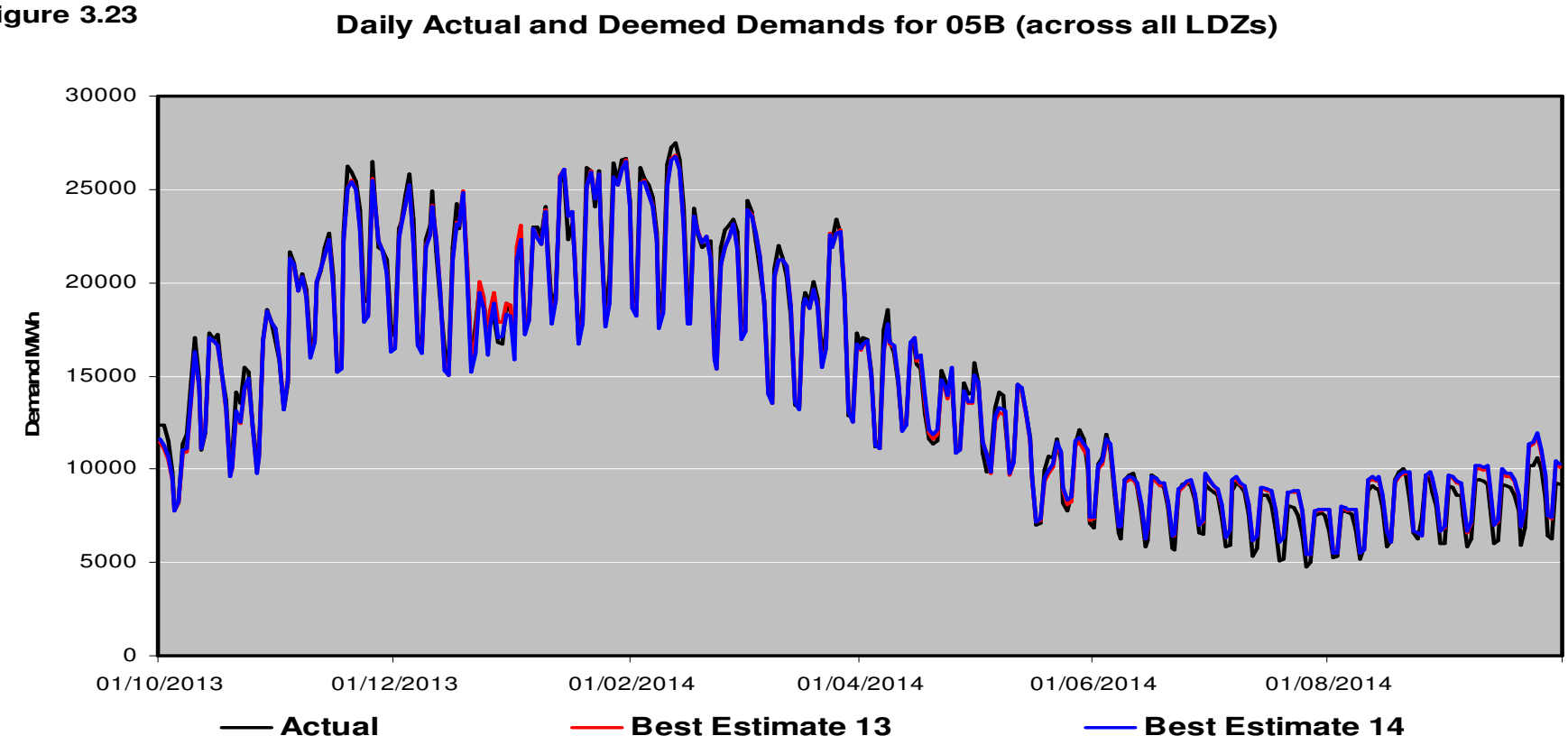
Figure 3.19



- 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 days (11th to 14th) in February 2014 and the generally warmer period in mid March and throughout April 2014.

Strand 3: NDM Sample Analysis
Daily Actual & Deemed Demand – 05B (All LDZs)

Figure 3.23



- The daily chart for Band 05 shows that allocated demand was generally close to actual demand. The most notable exception to this appears to be a general over allocation in the summer months (also seen across all other EUC bands).

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

- The “best estimate 13” & “best estimate 14” analyses suggest:
  - For bands all band (01 to 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 and too peaky profiles in bands 06, 07 & 08 (overall too peaky in bands 06, 07 & 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 2013-14.pdf'