NDM Algorithm Performance 2008/09 – Strand 2

Reconciliation Variance Analysis
NDM Sample Consumption Analysis

Supporting Document:
Evaluation of Algorithm Performance 200809.pdf

DESC 5th February 2010

Algorithm Performance 2008/09: Strand 2 Analysis

- Strand 1 (SF and WCF analysis) presented at Nov DESC
  - SF generally below 1 (closer than 07/08)
  - WCF deviation worsened in 08/09 (not comparable to 07/08)

- Strand 2: Reconciliation Variance Analysis
  - Compare allocated demand (derived from algorithms) *with*
  - Actual demand obtained from available reconciliation data

- Strand 2: Analysis of NDM Sample Consumption
  - Compare the actual demand from the NDM sample data *with*
  - Allocated demand for the sample

- *Supporting document: detailed explanation with full examples*

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# Reconciliation Variance (RV) 08/09: Actual to Allocated

- 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'

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Assessment of Standard and Suppressed Reconciliation
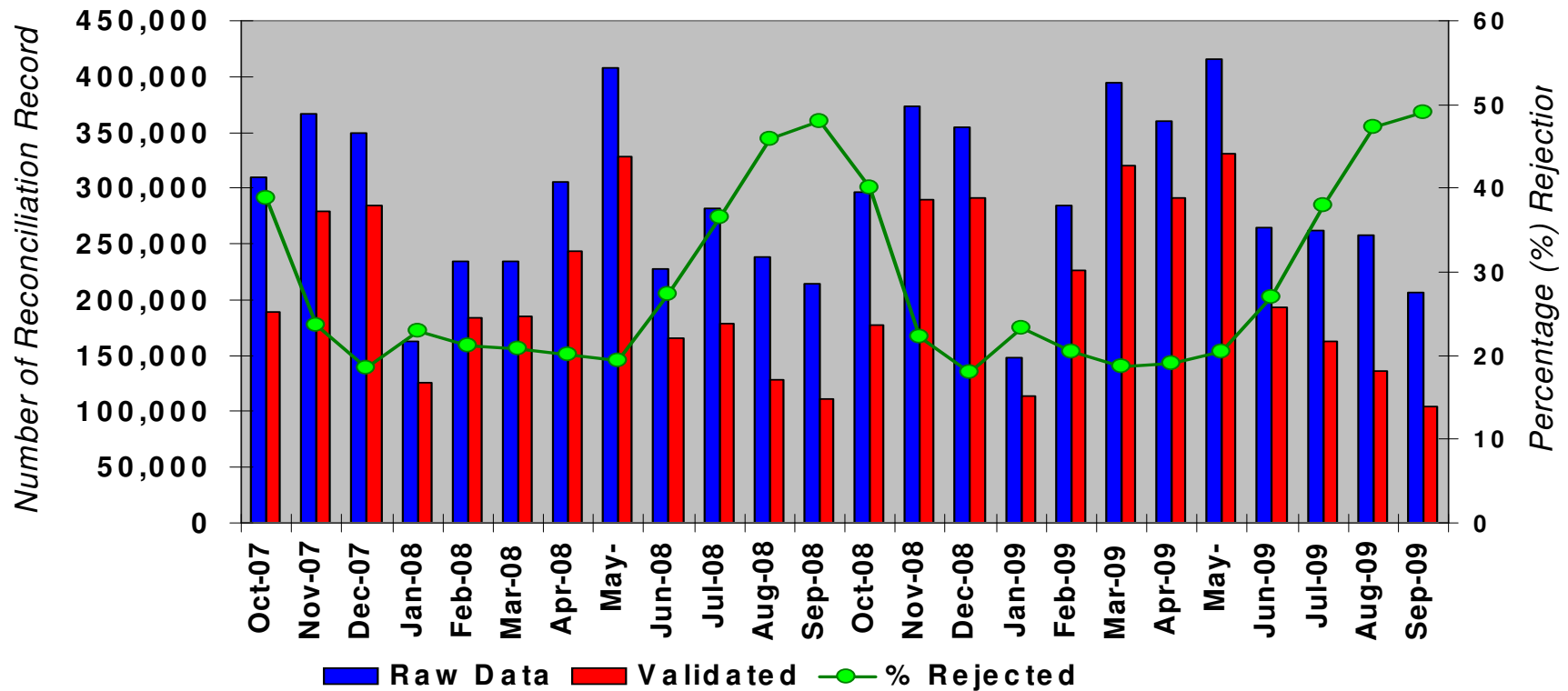(based on reconciliations during April to September 2009)
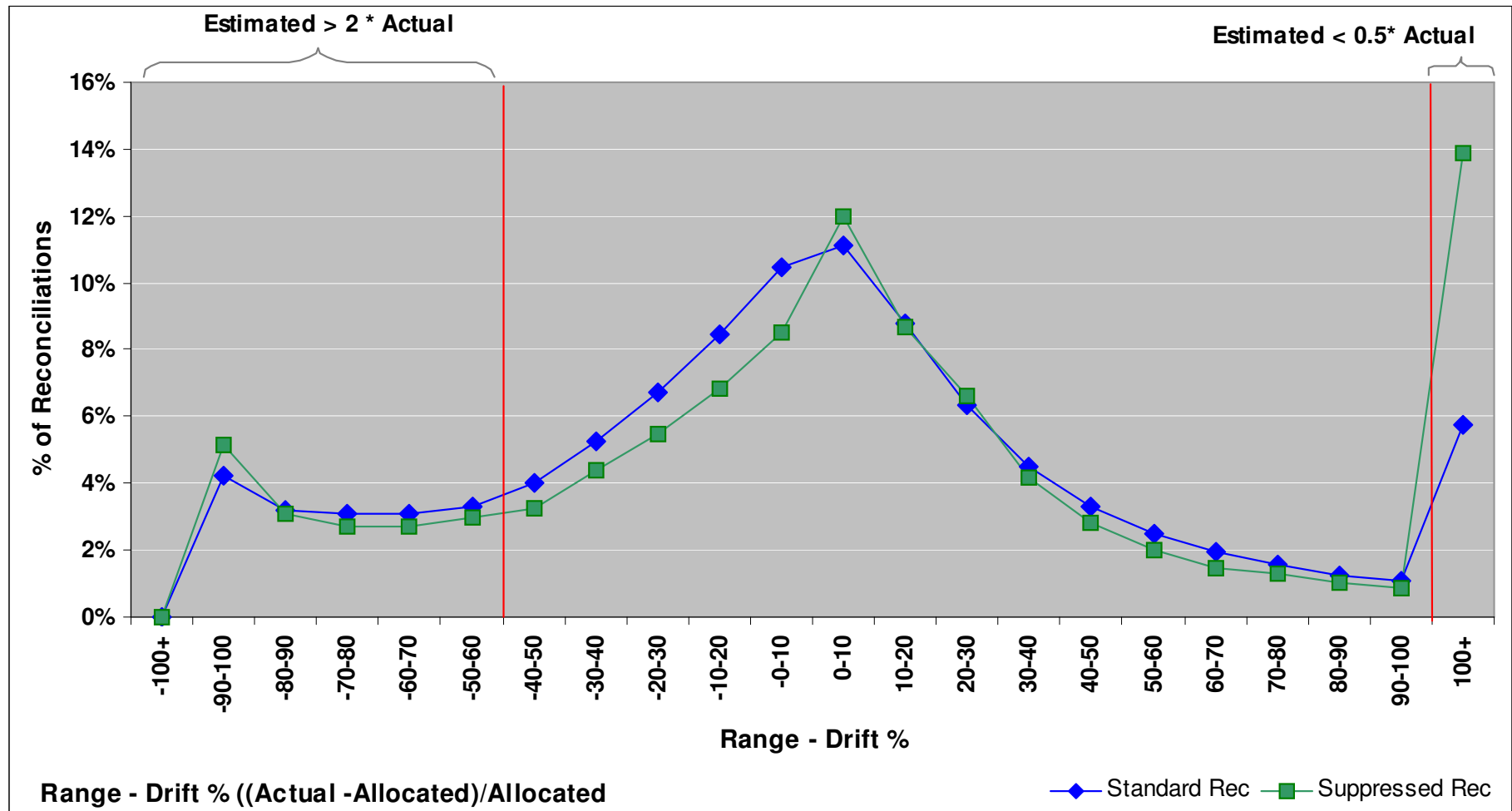
RV Analysis - Data Envelope

Estimated

Estimated = 2 * Actual

Estimated = Actual

Estimated = 0.5 * Actual
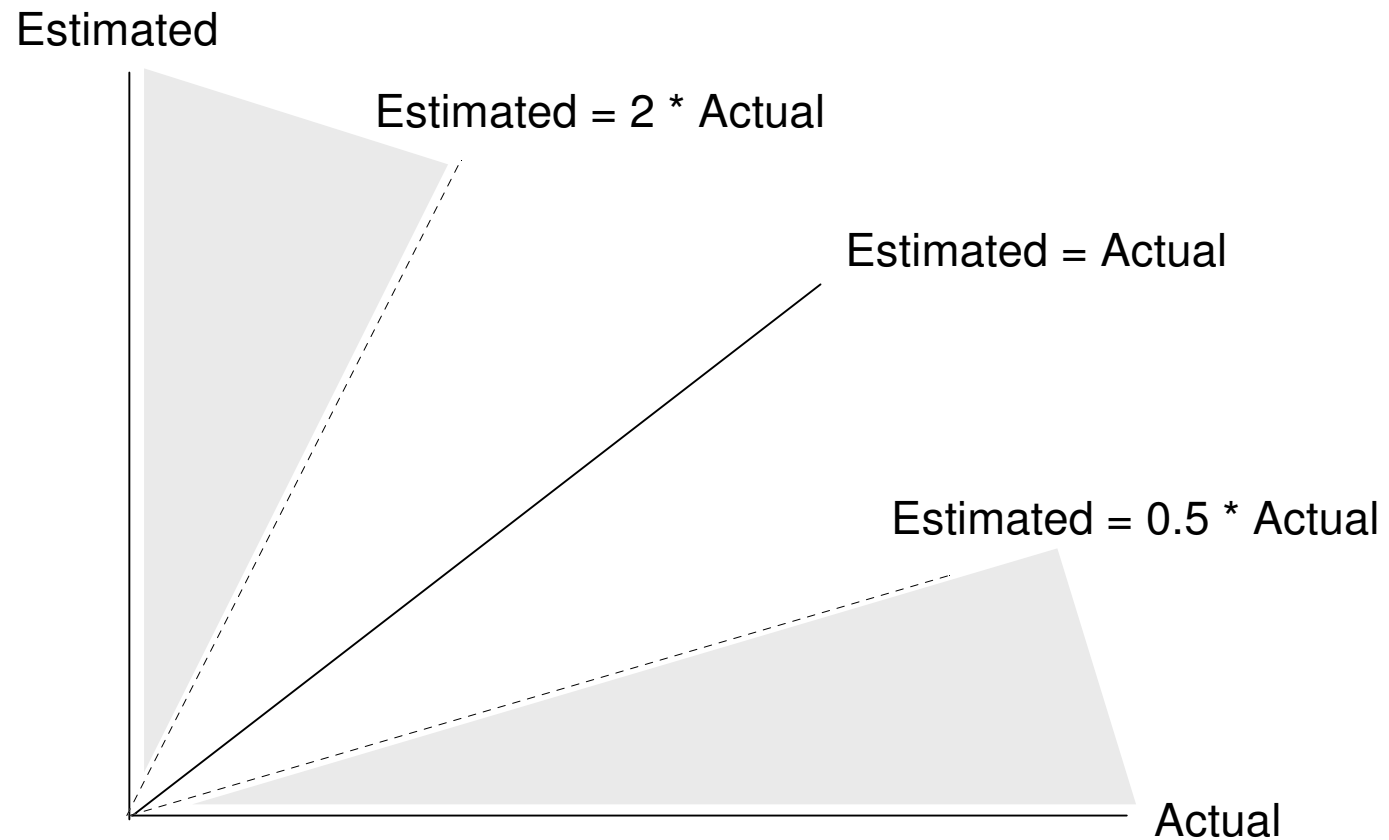
Actual

RV Analysis: Levels of Validation Fall Out

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

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 Appendix.

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NW: Consumption Band 02 (Pre-Scaling) RV Analysis – Allocated to Actual

RV ANALYSIS - FIGURE 2.1
North West (NW): Consumption Band 02 (Pre-Scaling)
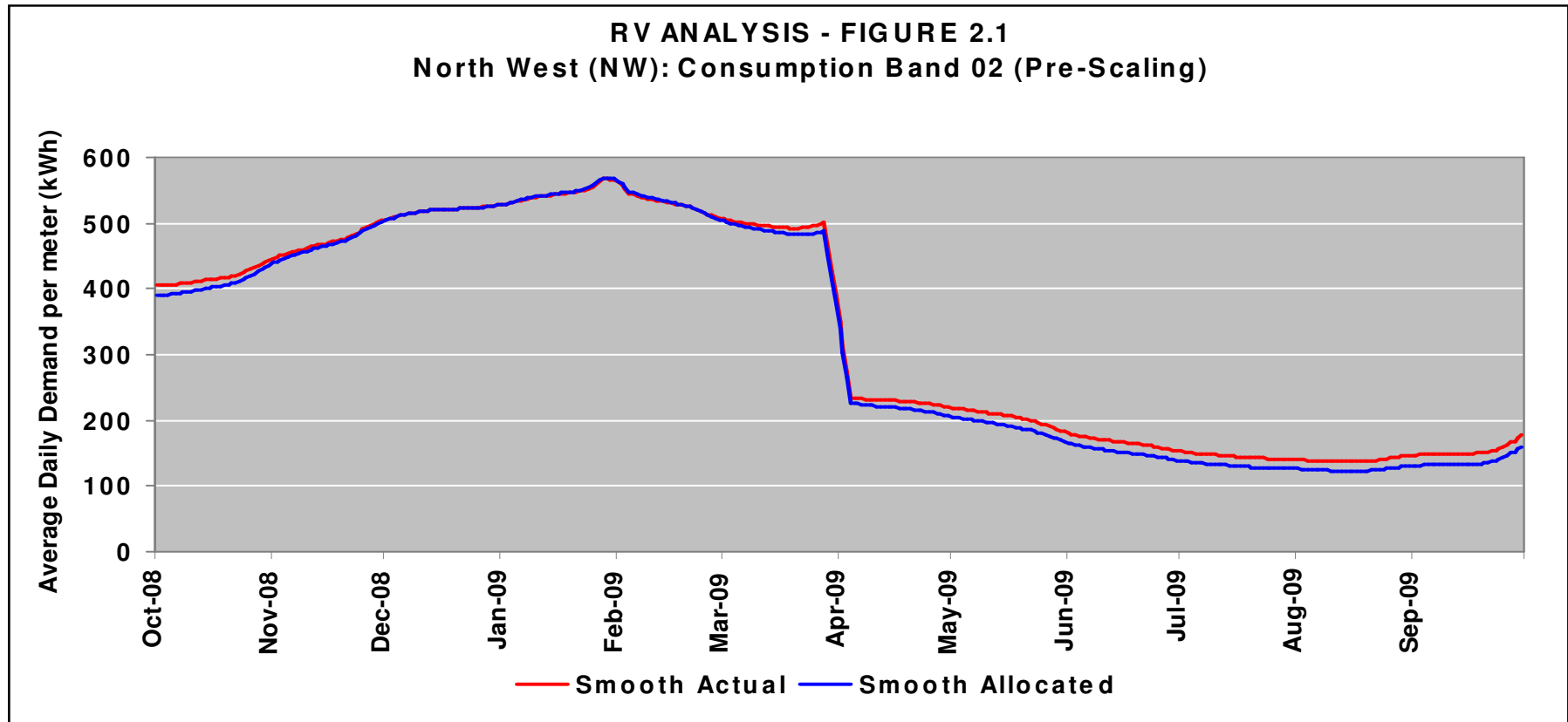
- 1st chart highlights where scaling has not occurred and profile of demand through the year
- Following scaling…..

NW: Consumption Band 02 (After Scaling)
RV Analysis – Allocated to Actual

RV ANALYSIS - FIGURE 2.2
North West (NW): Consumption Band 02 (After Scaling)
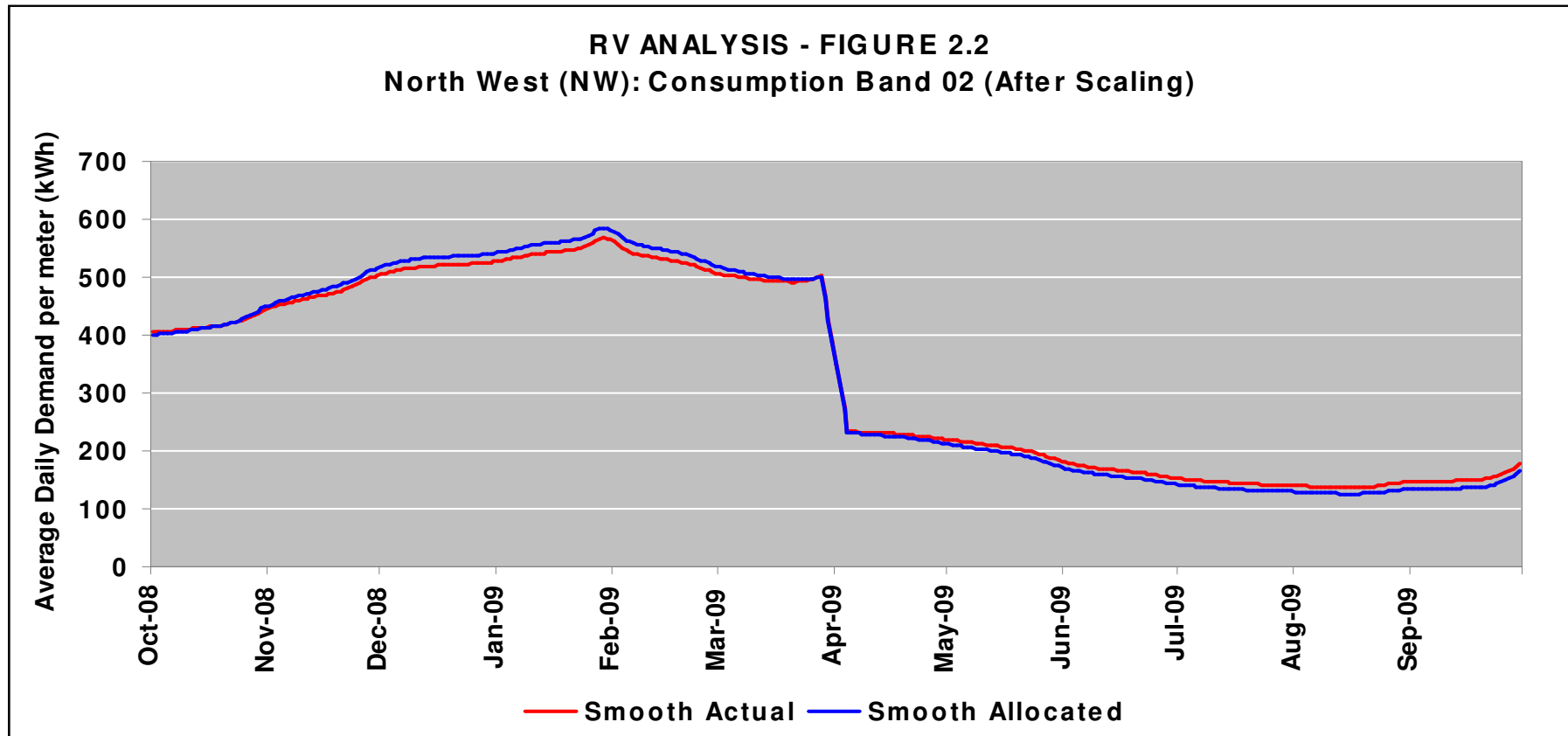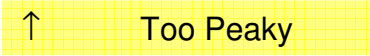
- Analysis allows comparison of the profiles rather than demand levels
- Indicates an over allocation in the Winter & under allocation in the summer
- **'Peaky' allocated profile:** Winter over, Summer under (predominant profile)

RV Categorisation : LDZ / EUC Profile & Error Levels
Gas Year 2008/09

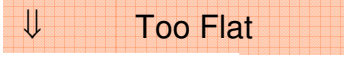| EUC	BAND	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
02	B	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
03	B	⇑	↑	⇑	⇑	⇑	↑	⇑	↑	↑	↑	↑	↑	⇑
04	B	↑	-	↑	↑	-	-	⇑	-	-	↑	↑	-	-
05	B	-	-	↑	-	-	-	⇑	-	↑	-	-	-	↑
06	B	-	-	↑	↑	-	↑	↓	-	-	-	↓	-	↓
07	B	-	-	⇑	⇓	⇑	-	⇓	↑	-	-	↓	⇓	-
08	B		-	⇑	⇑	↓	-		⇑	↑	⇓	⇑	⇓	↑
09	B	↓				⇑	⇓							

Legend:

Ok / Good	-	5% Level	↑	Too Peaky	10 % Level	⇑	Too Peaky
No Data (<2)			↓	Too Flat		⇓	Too Flat

- '% level' = average difference of allocated to actual over the winter and summer differences (measures 'peakiness')

- 2008/09: 'Peaky' profile 47%, 'Ok' Profile 30%, 'Flat' 12%, No data for analysis 11%

- 2007/08: 'Peaky' profile 42%, 'Ok' profile 30%, 'Flat' 12%, No data for analysis 16%

- Profiles more 'Peaky'

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RV Categorisation : Annual Scaling
Gas Year 2008/09

EUC	BAND	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
02	B	1.02	1.05	1.03	1.02	1.03	1.04	1.01	1.02	1.03	1.02	1.03	1.03	1.04
03	B	1.04	1.06	1.04	1.05	1.03	1.04	1.06	1.04	1.06	1.04	1.05	1.03	1.03
04	B	1.05	1.07	1.05	1.05	1.05	1.05	1.01	1.08	1.06	1.04	1.05	1.04	1.06
05	B	1.03	1.06	1.03	1.05	1.04	1.02	1.01	1.05	1.08	1.05	1.04	1.04	1.06
06	B	1.04	1.09	1.04	1.04	1.03	0.98	1.05	1.02	1.04	1.04	1.02	1.05	1.01
07	B	1.03	1.05	1.03	0.99	0.99	0.93	1.16	0.96	0.96	0.96	0.91	1.03	1.02
08	B		0.99	1.10	0.99	1.06	1.00		1.04	1.03	0.84	0.89	0.98	1.12
09	B	1.04				0.94	0.97							

- Scaling values used to normalise calculated AQ to actual consumptions
  - (Pink) indicates uplift of allocated to actual consumptions: Suggests AQs too low 08/09
  - NDMAQs decreased at start of gas year 09/10

- However RV analysis:
  - Not reflective of whole population (excludes Band 01B)
  - Proportion of data discarded to allow profile analysis
  - All reconciliation data for gas year not yet available (more so this year)

- Therefore useful for profile comparison rather than determination of AQ trends

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RV Analysis Conclusions

- RV analysis highlights a 'peaky' trend of:
  - Over Allocation – Winter
  - Under Allocation – Summer

- 2008/09 saw 47% of profiles defined as 'peaky' (42% in 07/08):
  - 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 2010 - more data will be available
  - AQs continue to reduce each year

- BUT – analysis not necessarily representative of population
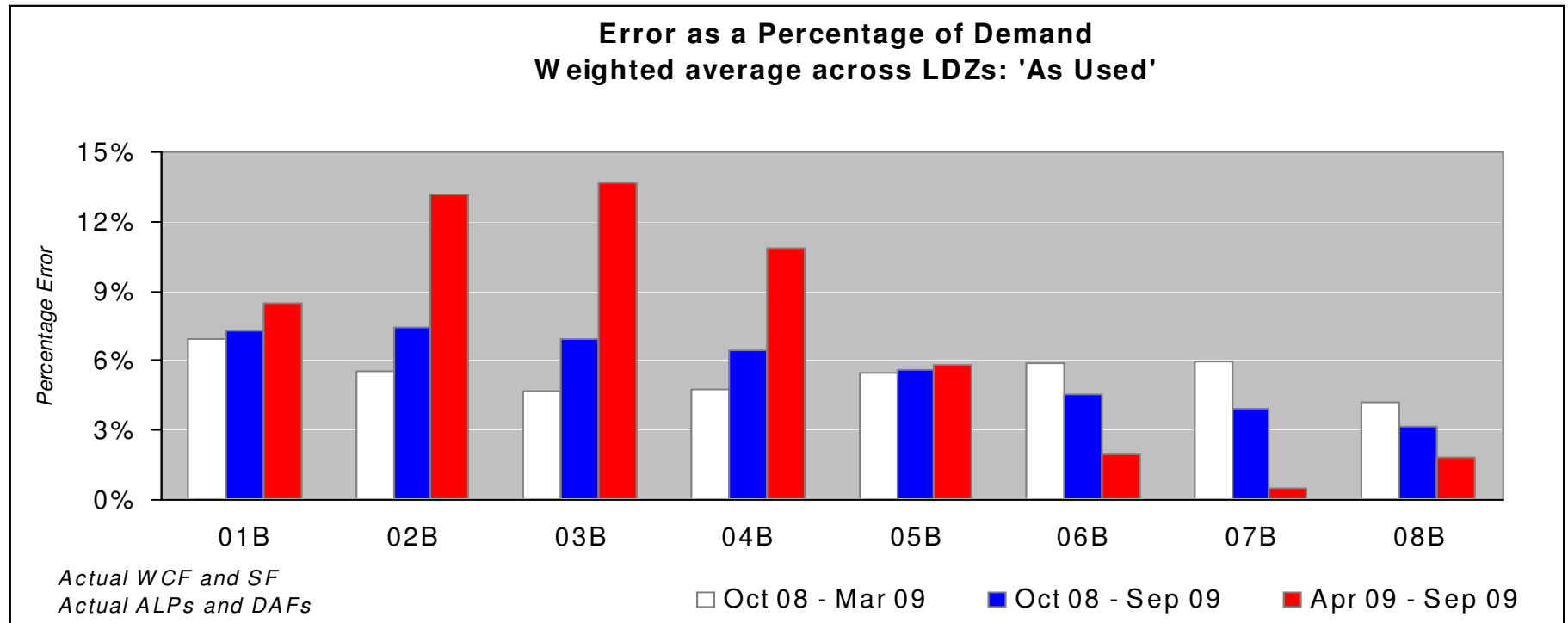 - Consider with SF and WCF analysis *and* NDM Sample data…

NDM Sample Consumption Analysis

- Using the actual NDM Sample consumption for 08/09

  - Compare the % error of sample consumption against three models :

    - Allocated using 08/09 ALPs & DAFs, real system WCF and SF - ("As Used")
    - Allocated using 08/09 ALPs & DAFs, EWCF and SF = 1 – (Best Estimate '08)
    - Allocated using 09/10 ALPs & DAFs, 08/09 EWCF and SF = 1 – (Best Estimate '09)

  - 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 08/09 Algorithms - NDM Sample derived AQs (not system AQs)

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

Legend: □ Oct 08 - Mar 09 ■ Oct 08 - Sep 09 ■ Apr 09 - Sep 09

Actual WCF and SF
Actual ALPs and DAFs

- Positive errors = Under allocation
- Positive errors across all consumption bands over 12 month period 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…..

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 2009/10
SC	4.1%	3.9%
NO	4.8%	5.2%
NW	3.8%	3.8%
NE	4.9%	4.7%
EM	5.1%	5.0%
WM	5.9%	5.1%
WN	-	-
WS	4.2%	4.3%
EA	5.2%	4.5%
NT	3.4%	3.2%
SE	4.5%	4.2%
SO	5.8%	5.4%
SW	5.2%	4.7%
Overall	4.7%	4.4%

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Allocated Error As % of Actual Demand
Weighted average across LDZs. 'Best Estimate 08'
EWCF and SF =1 – ALPs and DAFs 08/09 Algorithms - NDM Sample derived AQs (not system AQs)

Figure 3.2: Error as a Percentage of Demand
Weighted average across LDZs: 'Best Estimate 08'
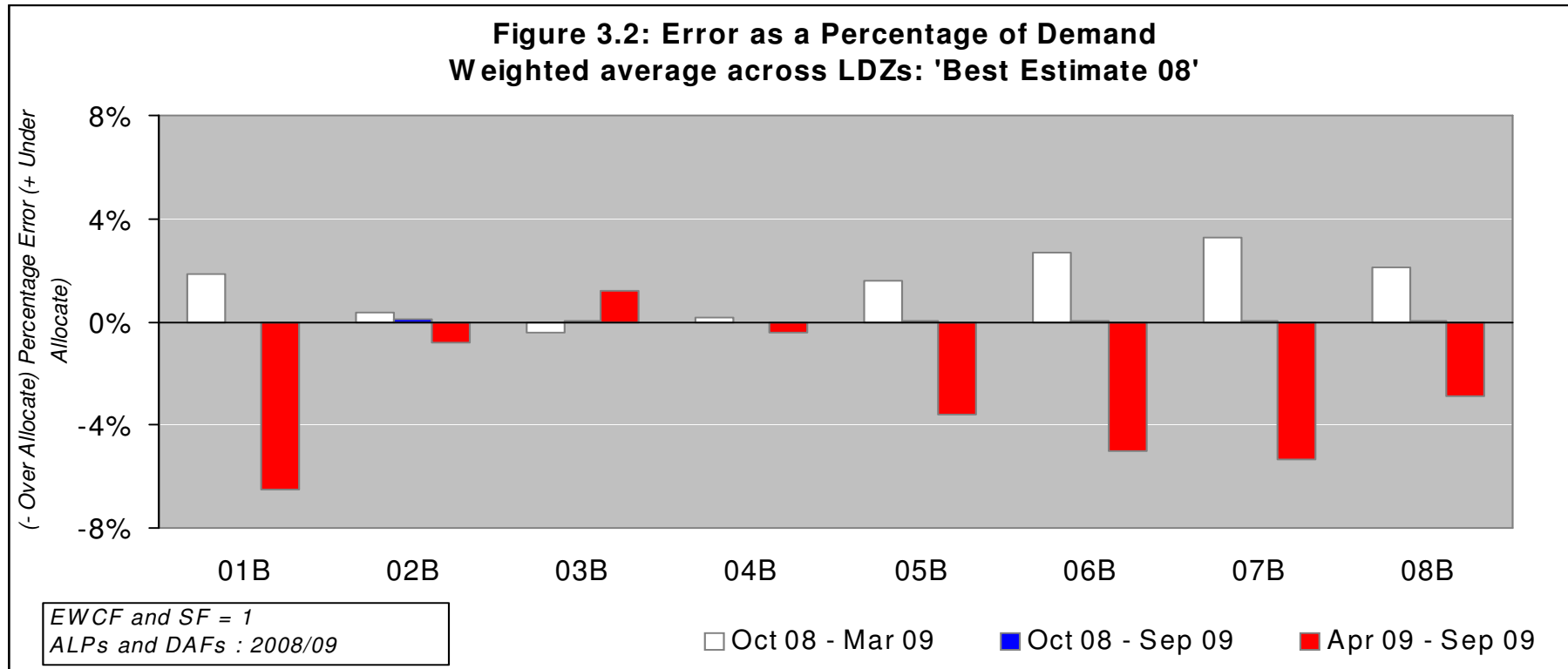
- Remove SF impact and use EWCF which avoids potential bias in WCF
- Positive errors = Under allocation ; Negative errors = Over allocation
- Winter/Summer analysis indicates bands 01,02,04,05,06,07,08 little too flat and 03 little too peaky
- Over year: Little overall error in each band (Range -0.05% and 0.07% for all bands)

Allocated Error As % of Actual Demand
## Weighted average across LDZs. 'Best Estimate 09'
EWCF and SF =1 – ALPs and DAFs 09/10 Algorithms - NDM Sample derived AQs (not system AQs)

Figure 3.3: Error as a Percentage of Demand
Weighted average across LDZs: 'Best Estimate 09'
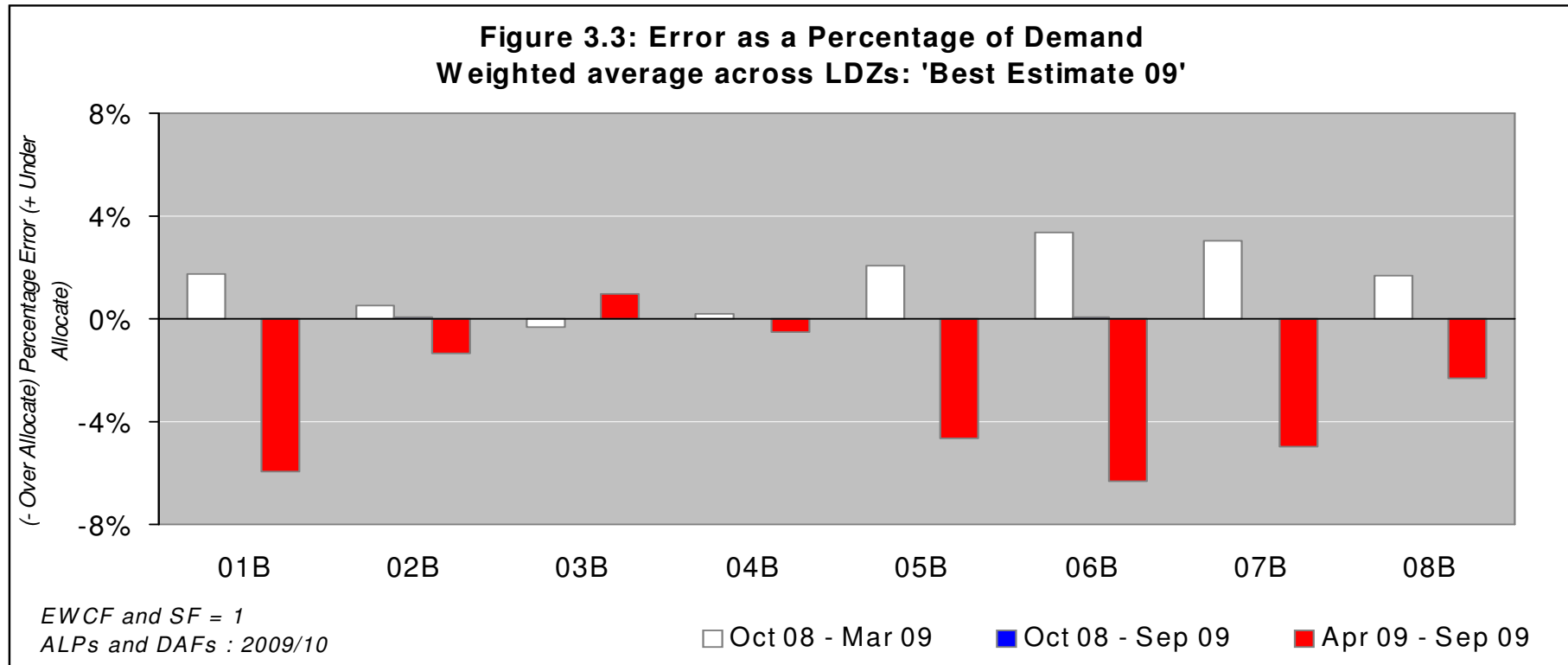
- ALPs and DAFs for 2009/10 applied to 2008/09 consumption data
- Should provide less error as ALPs and DAFs were derived from this consumption data
- Winter / Summer errors are slightly improved for bands 01,03,07 and 08. Slightly worse for 02,04,05 and 06
- Over whole year extent of error is slightly reduced using 09/10 algorithms in most EUCs
- Monthly analysis also completed…

Monthly Actual & Deemed Demand
01B (All LDZs)
As previous but by EUC Band and By Month
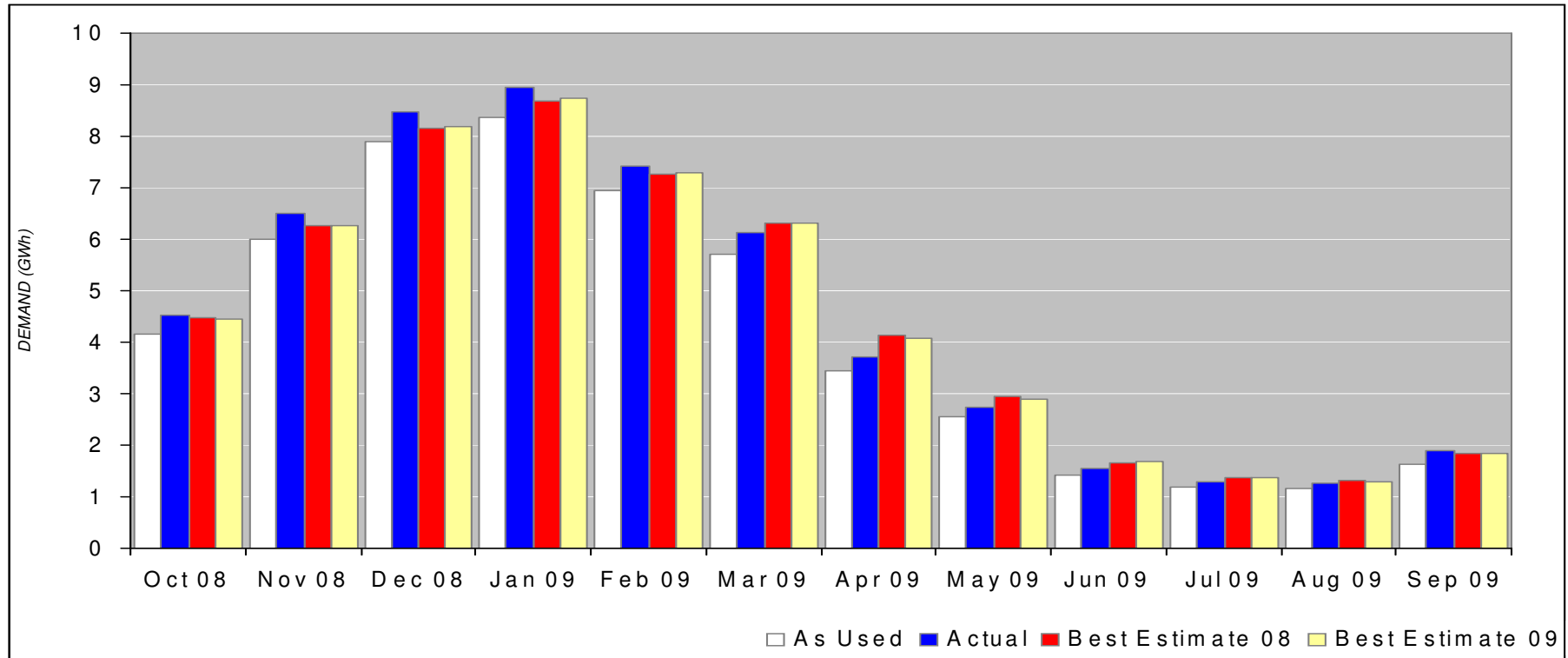
- Results also provided for previous models but by EUC Band and Month - Equivalent charts for all consumption bands included in supporting document

- Band 01B profile – indicates winter under allocation (except March) and summer over allocation

- Relevant to recall weather conditions in 08/09 when interpreting results

  - All months during winter were colder slightly or clearly colder than seasonal normal (except March)

  - Summer months generally warmer than seasonal normal basis

RV Analysis & NDM Sample Analysis

- The "best estimate 08" & "best estimate 09" analyses suggest:
  - For bands 01, 02, 04, 05, 06, 07 & 08: under allocation (+ve errors) in the winter and over allocation (-ve errors) in the summer. → profile too flat.
  - For band 03: 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 (and overall below or at 5% level)
  - good in most LDZs (7 or more instances of 13) in bands 04, 05 and 06 (overall slightly too peaky in bands 04, 05 & 06, well below 5% level)
  - mixture of good, too peaky and too flat profiles in band 07 (overall a little too peaky, well below 5% level)
  - mixed picture in band 08 (profiles that were too peaky predominant) (overall a little too peaky, well below 5% level)

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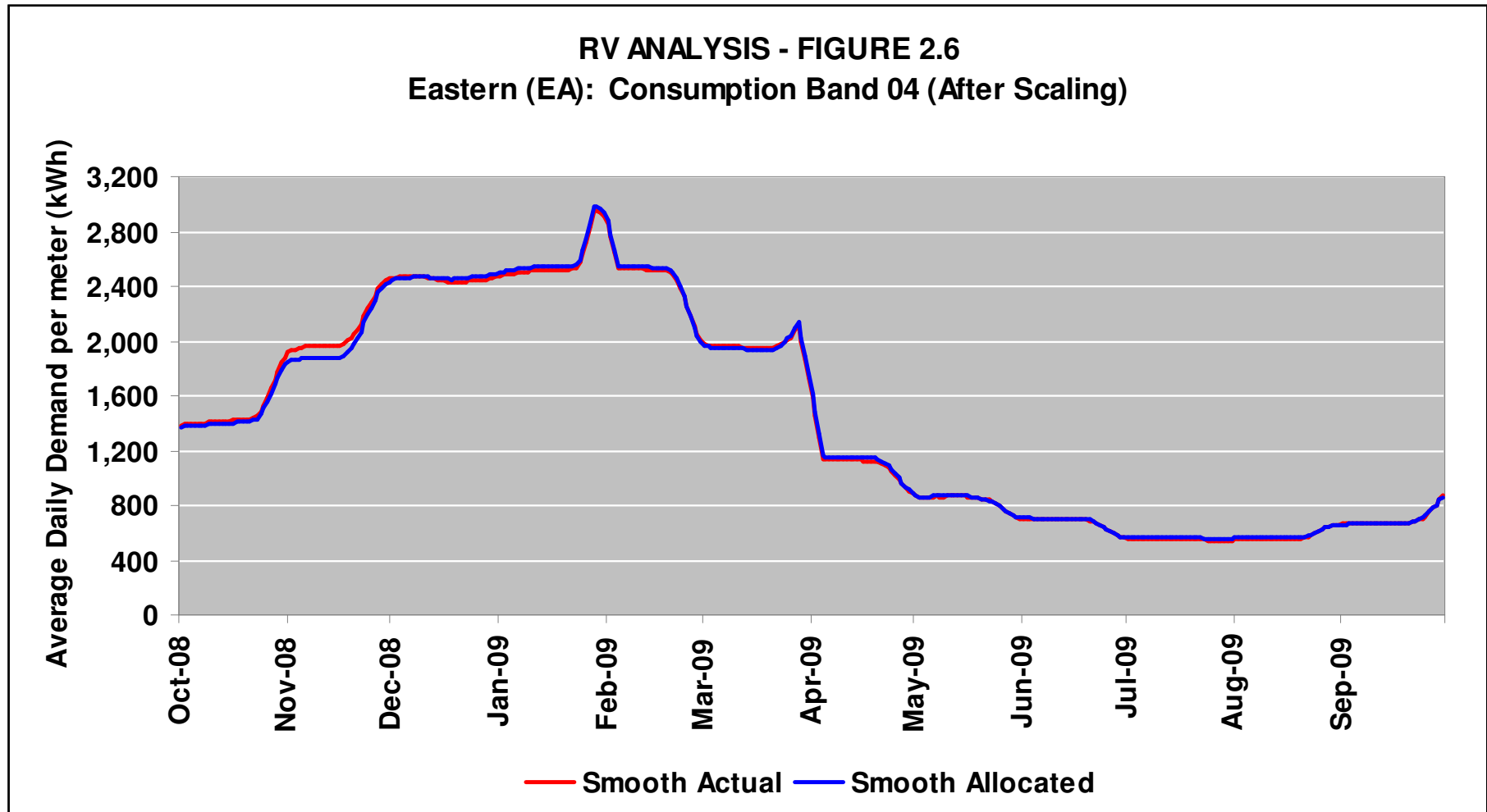# RV Analysis & NDM Sample Analysis Conclusions

- Limitations - different, restricted data sets
  - 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

- <u>Important Point:</u> Both approaches, subject to their limitations, suggest only small inaccuracies

- Spring 2010 RV analysis is updated to provide better representation

Appendices

SO: Consumption Band 03 (After Scaling)
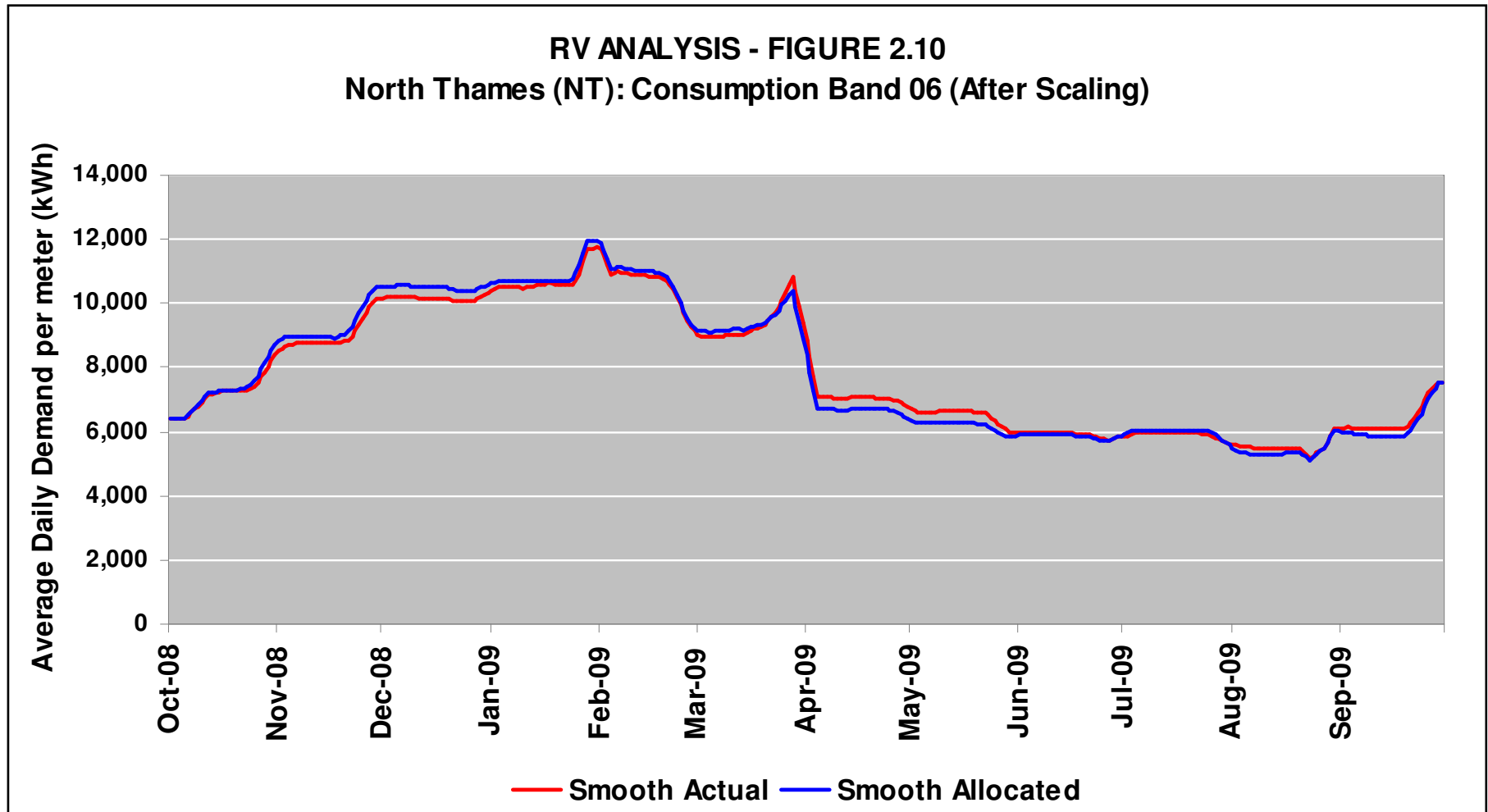# RV Analysis – Allocated to Actual
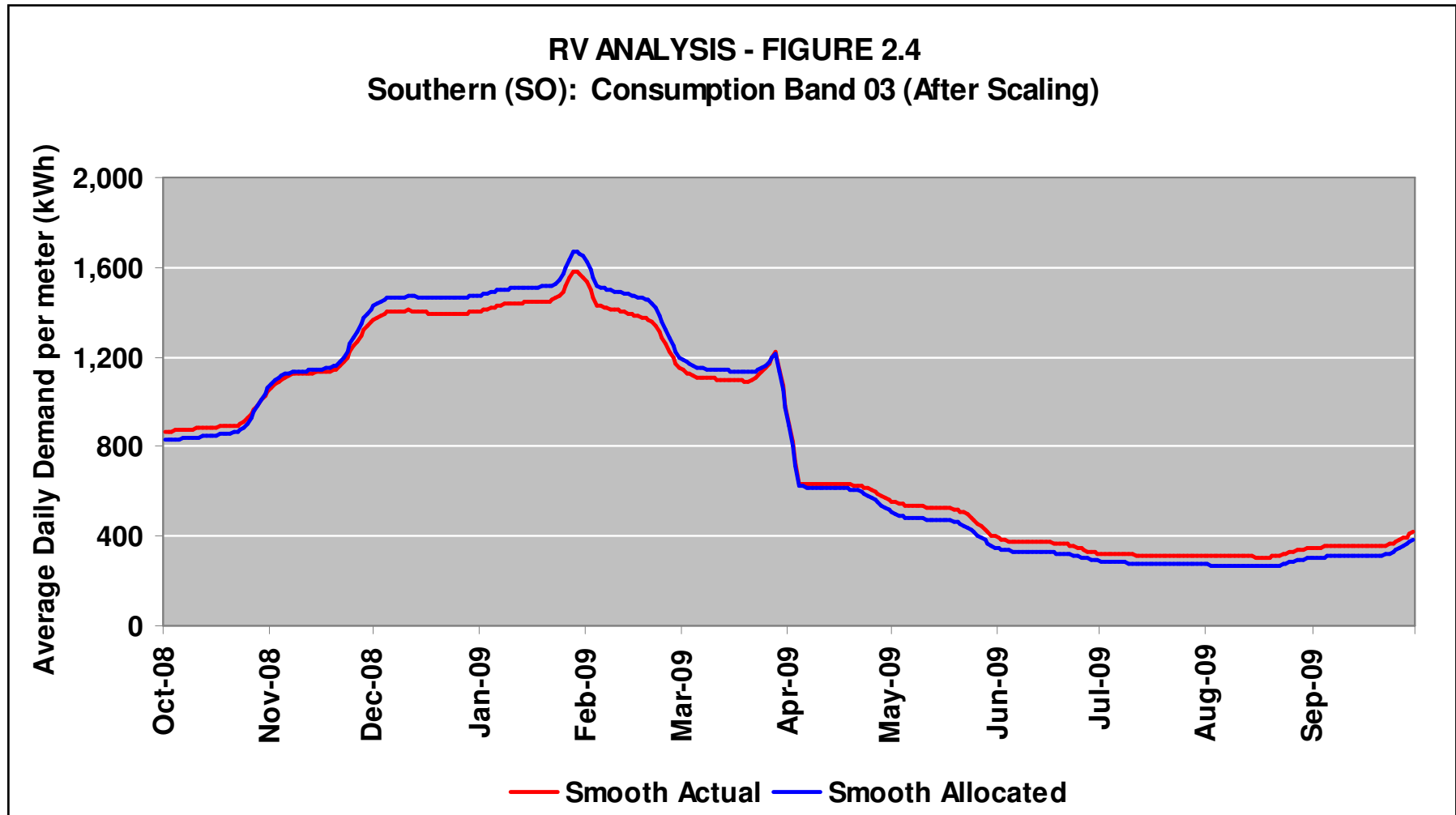
RV ANALYSIS - FIGURE 2.4
Southern (SO): Consumption Band 03 (After Scaling)

— Smooth Actual — Smooth Allocated

EA: Consumption Band 04 (After Scaling)
RV Analysis – Allocated to Actual

RV ANALYSIS - FIGURE 2.6
Eastern (EA): Consumption Band 04 (After Scaling)

— Smooth Actual — Smooth Allocated

EM: Consumption Band 05 (After Scaling)
RV Analysis – Allocated to Actual

RV ANALYSIS - FIGURE 2.8
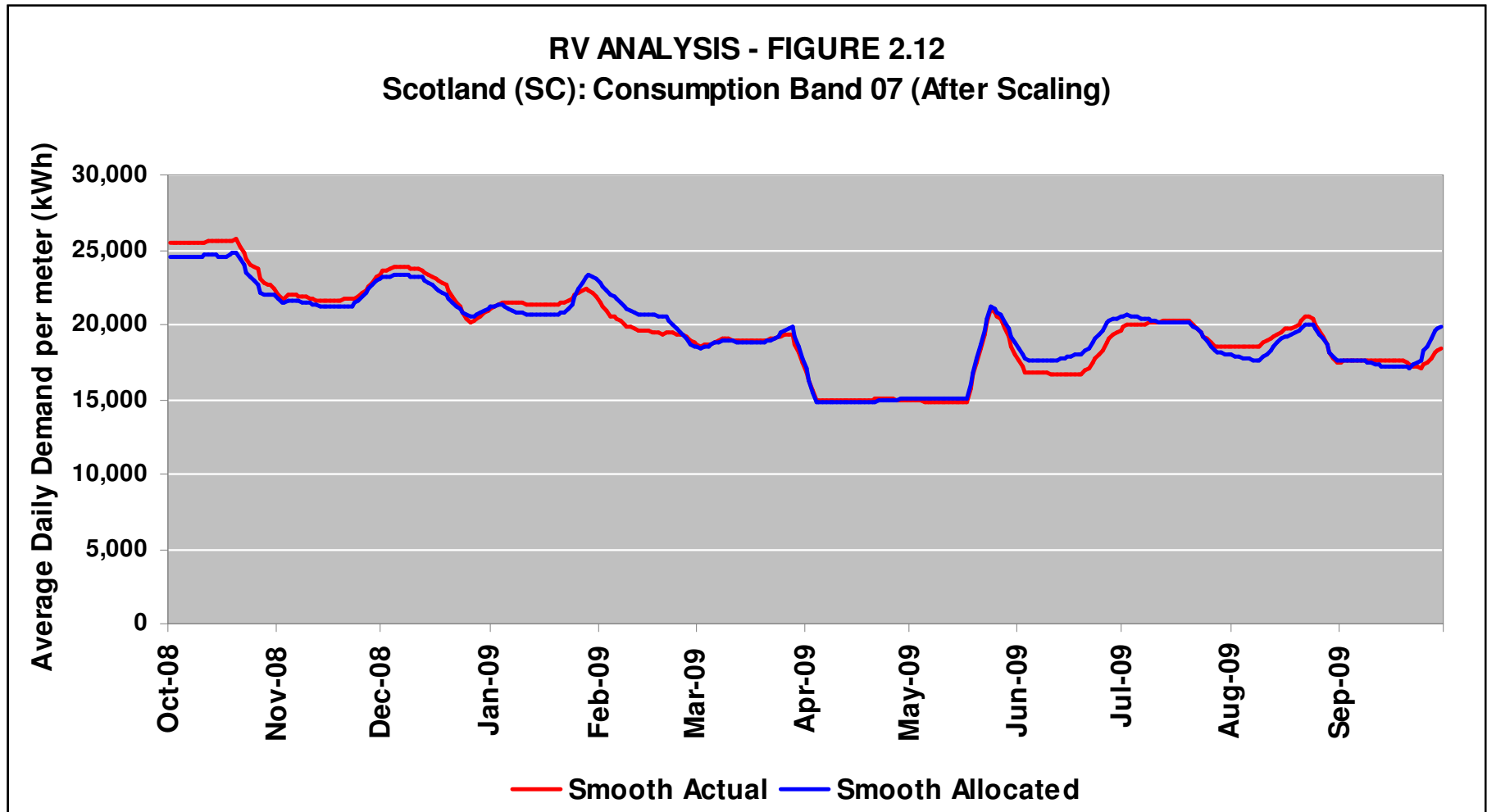East Midlands (EM): Consumption Band 05 (After Scaling)
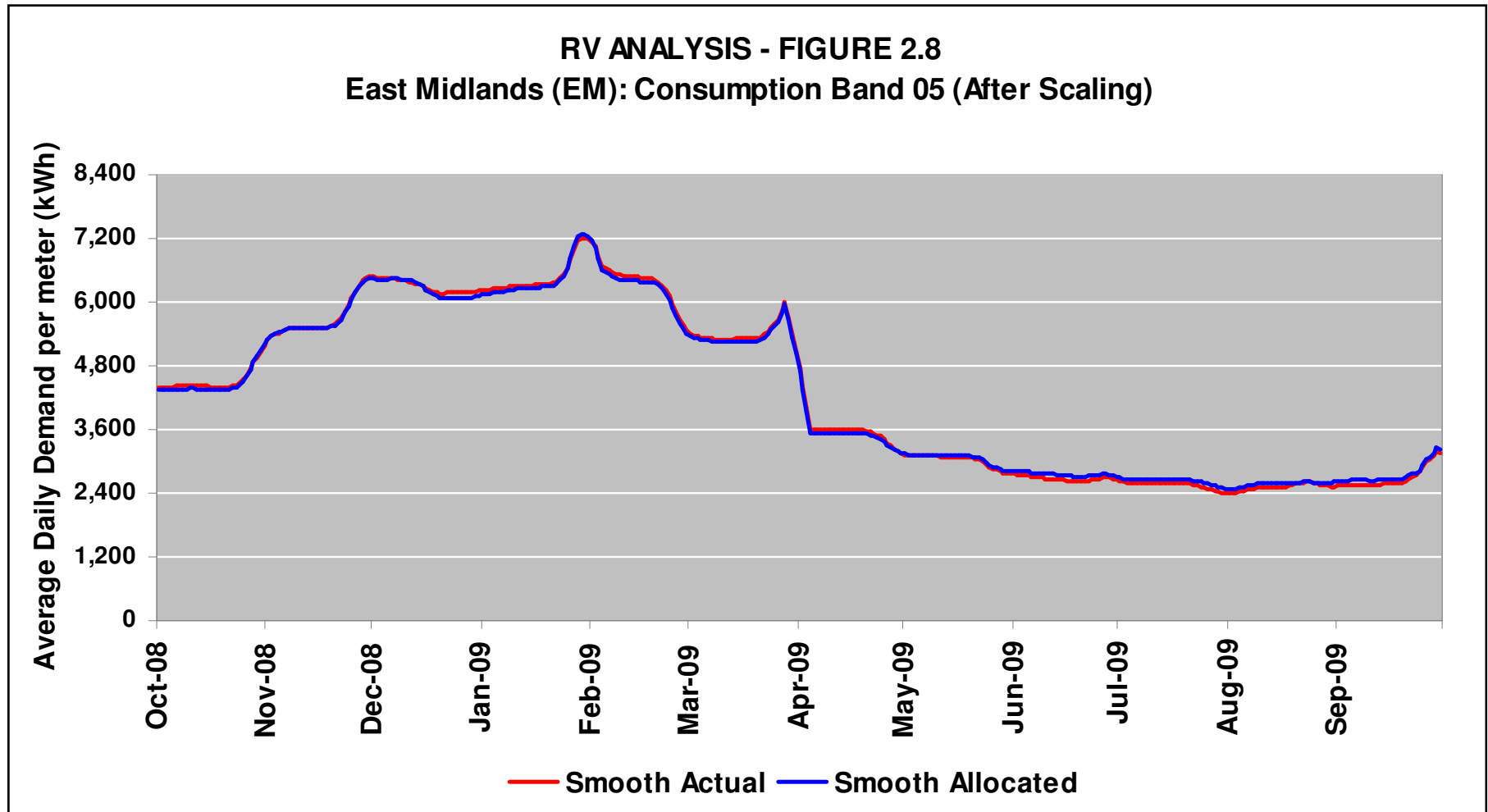
NT: Consumption Band 06 (After Scaling)
RV Analysis – Allocated to Actual

SC: Consumption Band 07 (After Scaling)
RV Analysis – Allocated to Actual

RV ANALYSIS - FIGURE 2.12
Scotland (SC): Consumption Band 07 (After Scaling)

NO: Consumption Band 08 (After Scaling)
RV Analysis – Allocated to Actual

RV ANALYSIS - FIGURE 2.14
Northern (NO): Consumption Band 08 (After Scaling)

Legend: — Smooth Actual — Smooth Allocated

Y-axis: Average Daily Demand per meter (kWh)