Demand Estimation Sub Committee
NDM Algorithm Performance (Gas Year 2016/17)

13th February 2018

Background

- The implementation of Project Nexus on 1st June 2017 introduced a revised NDM demand formula, meaning some of the previous Algorithm Performance measures became redundant

- Discussions took place at DESC meetings during the build up to Nexus implementation which concluded on the following strands:

  - Strand 1 – Weather Analysis
  - Strand 2 – Unidentified Gas Analysis
  - Strand 3 – NDM Daily Demand Analysis
  - Strand 4 – Reconciliation Analysis

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Objective

- The purpose of Algorithm Performance is to:
  - Provide confidence in the NDM Supply Meter Point Demand formula for the most recently concluded Gas Year (2016/17 in this instance)
  - Identify possible areas of improvement for future demand modelling

- Analysis already completed on Gas Year 2016/17
  - Strand 1 (Weather) & Strand 3 (NDM Daily Demand) analysis was completed for all months of Gas Year 2016/17
  - Strand 2 (UIG) analysis was limited to the four months of June to September'17 of Gas Year 2016/17

- Objective of today's session is to review analysis examples for Strand 4
  - Since Reconciliation data using the post Nexus NDM demand formula is limited to the months of June to September 2017, analysis for Gas Year 2016/17 is also limited
  - Analysis can only provide high level re-assurance due to the method of apportioning actual consumption in line with the algorithm, when deriving monthly Reconciliation variances

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NDM Supply Meter Point Demand formula

The revised NDM demand formula (effective from 1st June 2017) is shown below:

$$SPD_t = ((AQ/365) \times ALP_t \times (1 + (DAF_t \times WCF_t)))$$

where:

AQ = Annual Quantity

ALP_t = Annual Load Profile

DAF_t = Daily Adjustment Factor

WCF_t = Weather Correction Factor

Further detail on the above parameters can be found in the 'NDM Demand Estimation Methodology' document
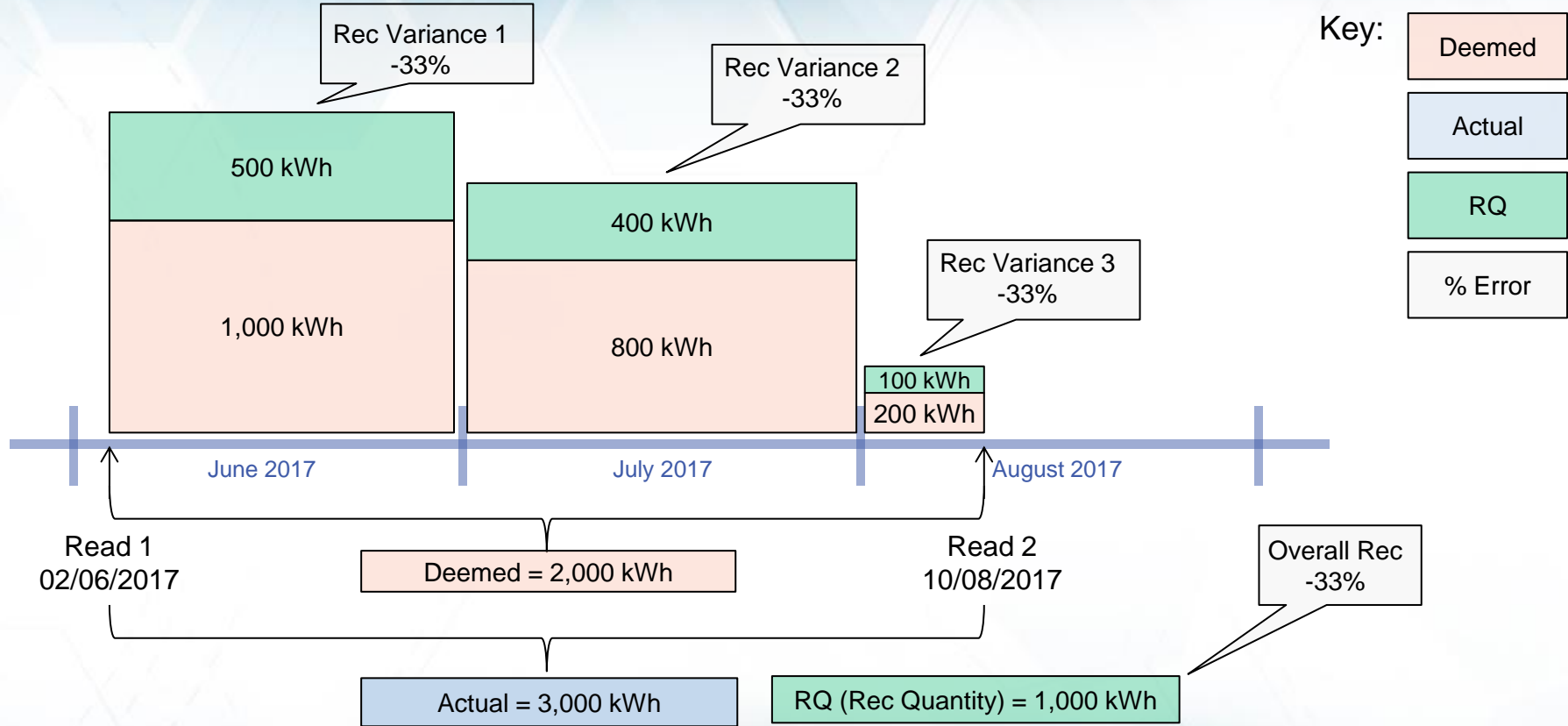
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Reconciliation Overview

- Following changes bought about by UNC Mod 0432 on 1st June 2017, all NDM supply meter points (circa 24 million) are now subject to individual Reconciliation

- Reconciliations are calculated at individual meter point level, usually on receipt of a valid meter read

- The Reconciliation period is defined by the date of the start and end (Actual) meter reads

- Reconciliation Quantity (RQ) is the difference between the measured consumption (based on the start and end meter reads) and the deemed consumption (given by the NDM Demand Formula)

- NDM Reconciliation periods are now summarised into monthly variance periods, with the 'Actual' energy being apportioned in line with the deemed consumption (given by the NDM Demand Formula)

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Strand 4 – Reconciliation Analysis: Approach

- DESC have not provided any detailed guidance on how Strand 4 should be carried out, so Xoserve proposes the following:

- Compare deemed consumption (given by the NDM Demand Formula) with the measured consumption from available Reconciliations
  - Data available at the time of analysis (includes Recs invoiced in June to November 2017)
  - Analysis limited to the four months of June to September 2017 (i.e. Reconciliation Variances pre June'17 are ignored as they used the pre-Nexus algorithm)
  - Currently LSP data only (SSP data is proving difficult to extract at present due to volumes)

- Rejection criteria applied prior to analysis to remove inappropriate or erroneous Reconciliation data
  - Negative and Zero actual consumption
  - Actual to Allocated ratio (i.e. 'Deemed > 2 x Actual' and 'Deemed < 0.5 Actual')

- Compare monthly % errors across the range of applicable EUCs
  - Positive errors denote over allocation and negative errors denote under allocation
  - Duration of the Reconciliations included in analysis will affect the perceived results

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Strand 4 – Reconciliation Analysis: Example

Rec Variance 1
-33%

Rec Variance 2
-33%

Rec Variance 3
-33%

Key:

| Deemed |
| Actual |
| RQ |
| % Error |

500 kWh

1,000 kWh

400 kWh

800 kWh

100 kWh
200 kWh

June 2017

July 2017

August 2017

Read 1
02/06/2017

Read 2
10/08/2017

Overall Rec
-33%

Deemed = 2,000 kWh

Actual = 3,000 kWh

RQ (Rec Quantity) = 1,000 kWh

- Each monthly Rec Variance will show the same % Error as the overall Reconciliation
- Therefore, analysing shorter Reconciliations will give a more meaningful assessment

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Strand 4 – Reconciliation Analysis: Rejection Volumes

- Reconciliation variance can occur due to imperfections in the NDM Supply Meter Point Demand formula but other factors include erroneous AQs and incorrect Meter Reads
- Prior to analysis, screening attempts to remove Recs most likely affected by erroneous data
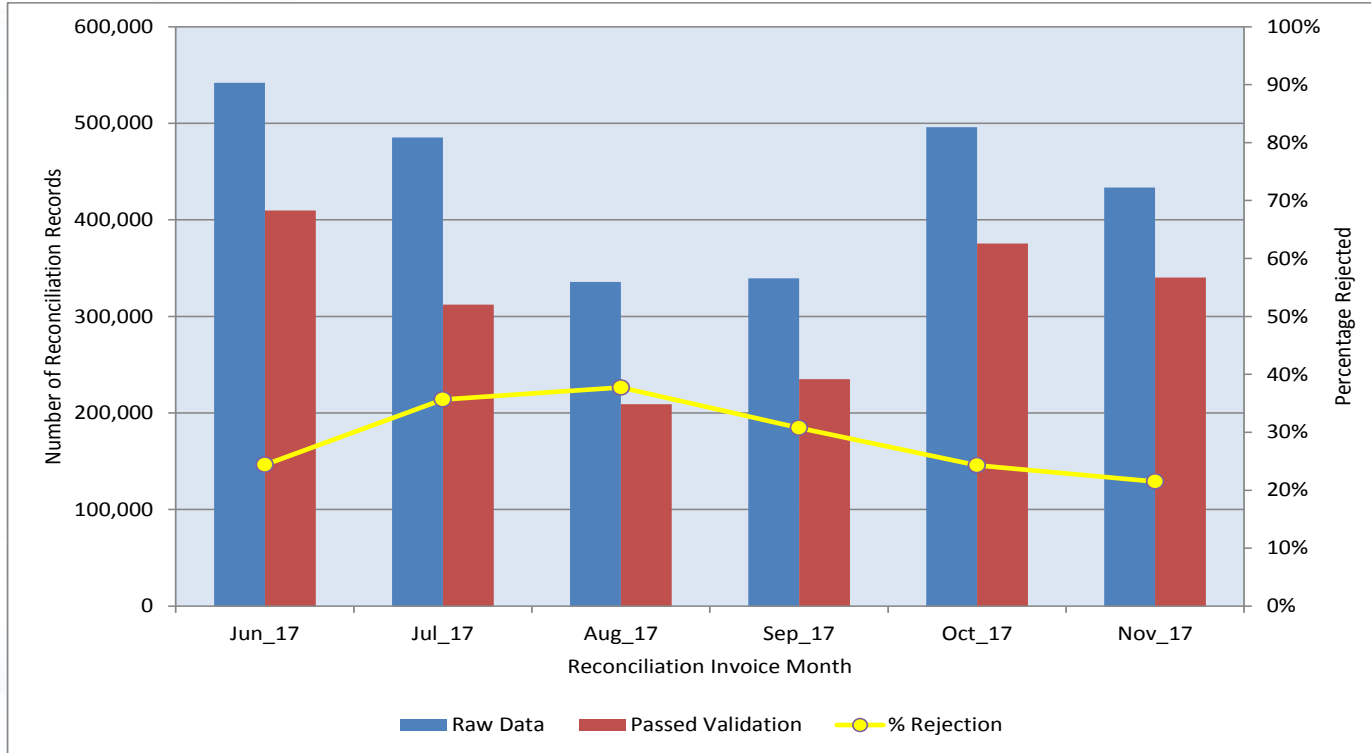
Rejection Category	Records	Rejection %
Class 1 or 2	77,127	2.9%
AQ <= 3	-	0.0%
Actual < 0	3,424	0.1%
Actual = 0	108,530	4.1%
Deemed>2 x Actual Demand	374,128	14.2%
Deemed<1/2 x Actual Demand	187,171	7.1%

Strand 4 – Reconciliation Analysis: B Band Comparison

Ldz Identifier

Sum of %Error

Reconciliation % Error - GY 2016/17 (All 13 LDZs)

Rec Var Year_Month
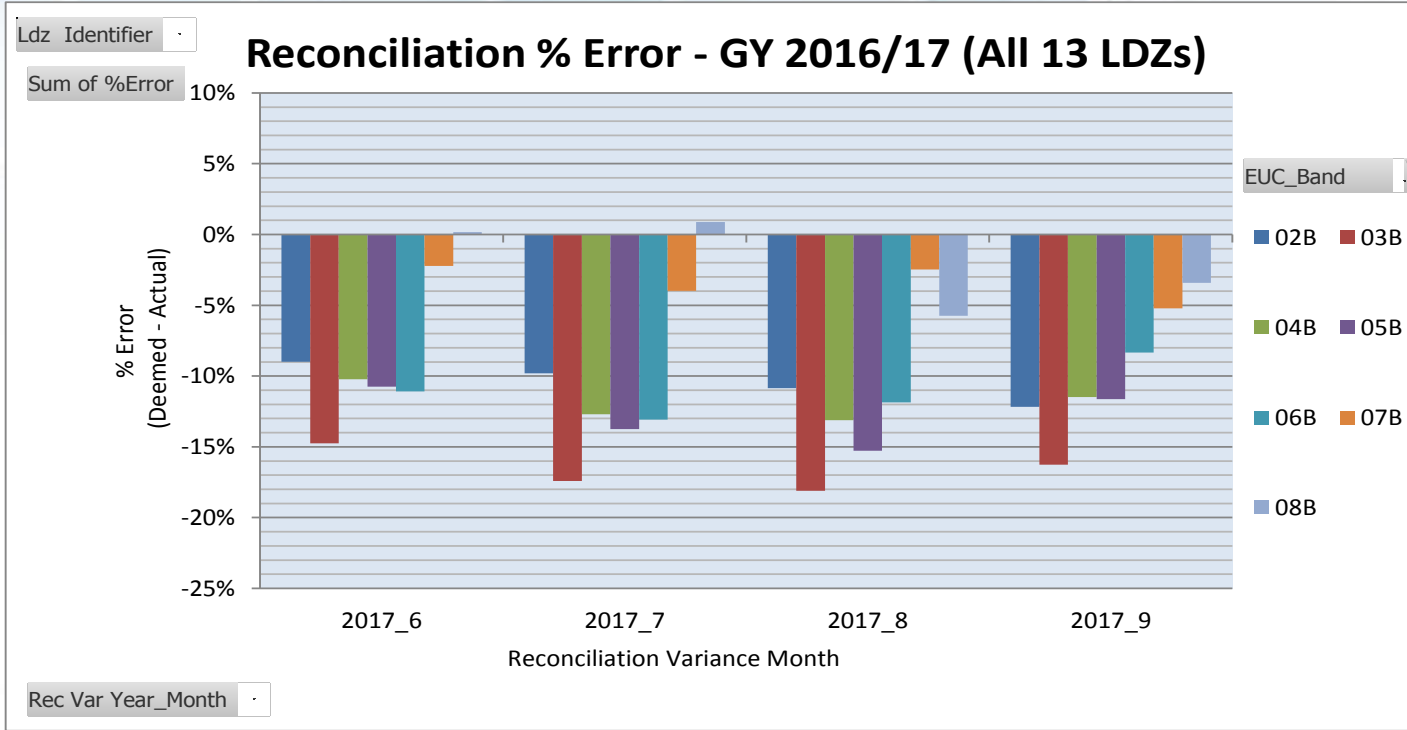
% Error Range (all days)		
Band	Min	Max
02B	-12.2%	-9.0%
03B	-18.1%	-14.7%
04B	-13.1%	-10.2%
05B	-15.3%	-10.7%
06B	-13.1%	-8.3%
07B	-5.2%	-2.2%
08B	-5.7%	0.9%

- B Band analysis shows a strong dominance of under allocation by the NDM algorithm (except for Band 08B in June & July'17)

Rec Duration in Days	02B	03B	04B	05B	06B	07B	08B
<31 days	11%	22%	25%	23%	21%	24%	21%
31 to 180	71%	72%	70%	69%	71%	64%	76%
181 to 365	15%	4%	4%	6%	6%	8%	3%
>365	3%	1%	1%	2%	1%	4%	0%

Strand 4 – Reconciliation Analysis: WAR Bands (Band 03)

Ldz Identifier

Sum of %Error

Reconciliation % Error - GY 2016/17 (All 13 LDZs)

Y-axis: % Error (Deemed – Actual), ranging 10% to -25%

X-axis: Reconciliation Variance Month — 2017_6, 2017_7, 2017_8, 2017_9

EUC_Band legend: 03B, 03W01, 03W02, 03W03, 03W04

Rec Var Year_Month
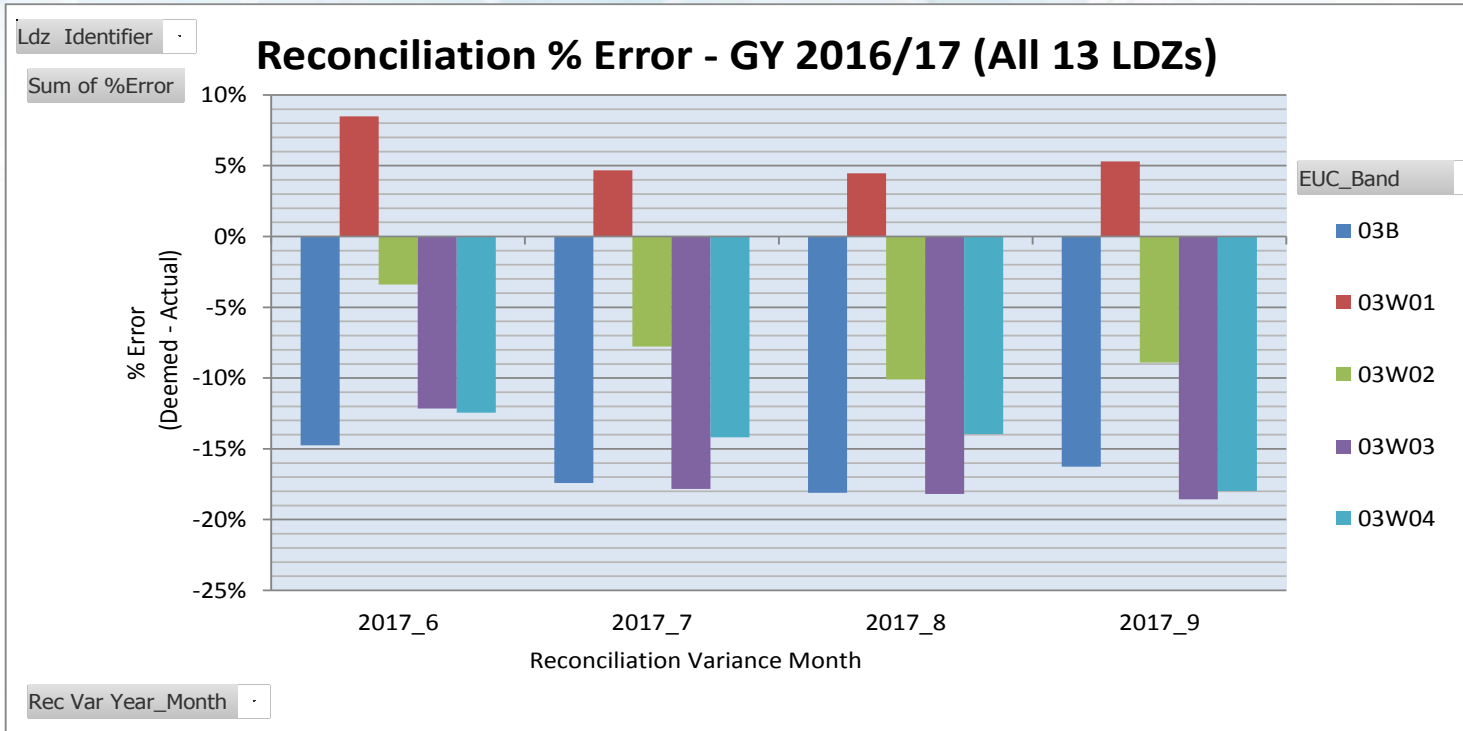
% Error Range (all days)		
Band	Min	Max
03B	-18.1%	-14.7%
03W01	4.5%	8.5%
03W02	-10.1%	-3.4%
03W03	-18.6%	-12.2%
03W04	-18.0%	-12.4%

- Band 03 WAR analysis shows under allocation in each of the four months with the exception of WAR Band 01
- 03B % error included for comparison

Rec Duration in Days	03B	03W01	03W02	03W03	03W04
<31 days	22%	27%	26%	26%	28%
31 to 180	72%	72%	73%	72%	70%
181 to 365	4%	1%	1%	2%	2%
>365	1%	0%	0%	0%	0%

Strand 4 – Reconciliation Analysis: WAR Bands (Band 04)

Ldz Identifier

Sum of %Error

Reconciliation % Error - GY 2016/17 (All 13 LDZs)

EUC_Band

- 04B
- 04W01
- 04W02
- 04W03
- 04W04

Y-axis: % Error (Deemed - Actual)

X-axis: Reconciliation Variance Month — 2017_6, 2017_7, 2017_8, 2017_9

Rec Var Year_Month
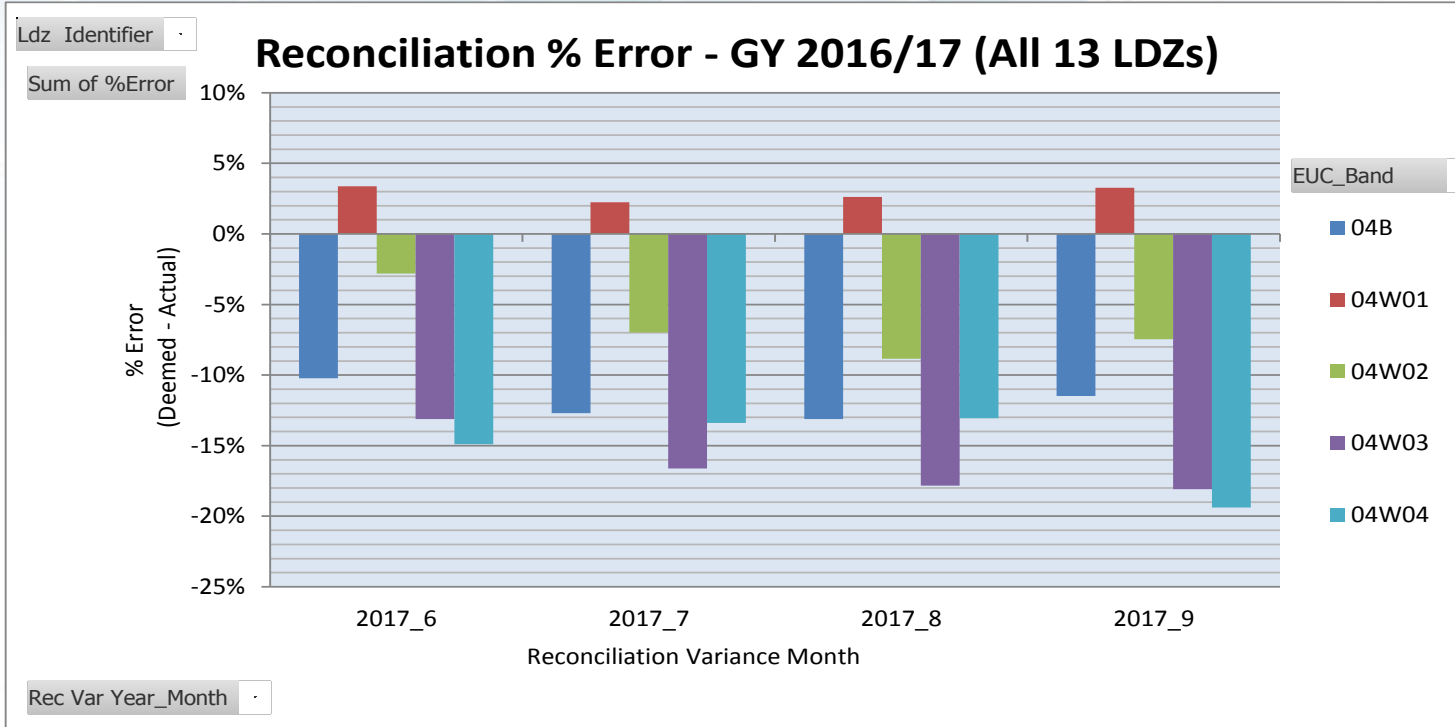
% Error Range (all days)		
Band	Min	Max
04B	-13.1%	-10.2%
04W01	2.2%	3.4%
04W02	-8.8%	-2.8%
04W03	-18.1%	-13.1%
04W04	-19.4%	-13.0%

- Band 04 WAR analysis shows under allocation with the exception of WAR Band 01
- 04B % error included for comparison

Rec Duration in Days	04B	04W01	04W02	04W03	04W04
<31 days	25%	35%	30%	27%	29%
31 to 180	70%	64%	69%	70%	68%
181 to 365	4%	1%	1%	3%	3%
>365	1%	0%	0%	0%	0%

Strand 4 – Reconciliation Analysis: WAR Bands (Band 05)

Reconciliation % Error - GY 2016/17 (All 13 LDZs)

Ldz Identifier

Sum of %Error

EUC_Band
- 05B
- 05W01
- 05W02
- 05W03
- 05W04

Y-axis: % Error (Deemed - Actual), from -25% to 10%

X-axis: Reconciliation Variance Month — 2017_6, 2017_7, 2017_8, 2017_9

Rec Var Year_Month
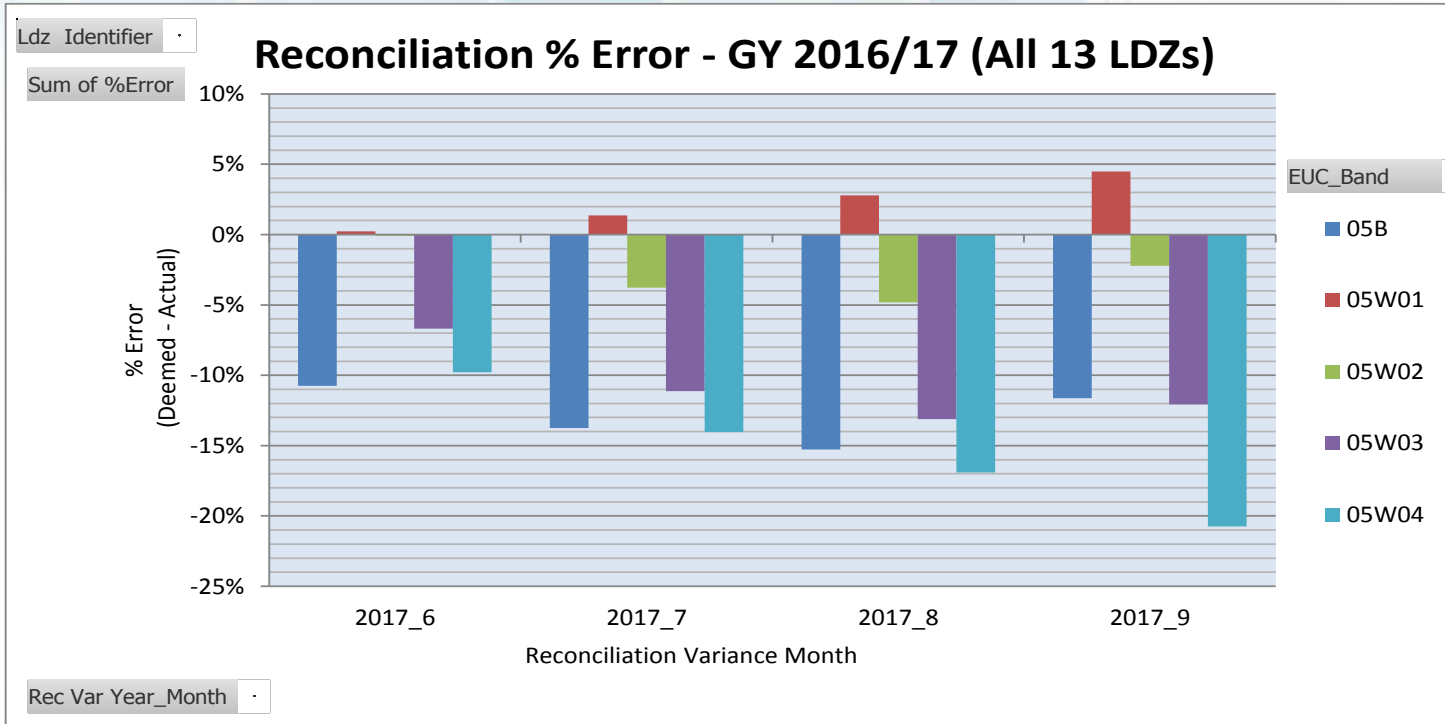
% Error Range (all days)

Band	Min	Max
05B	-15.3%	-10.7%
05W01	0.2%	4.5%
05W02	-4.8%	-0.1%
05W03	-13.1%	-6.7%
05W04	-20.7%	-9.8%

- Band 05 WAR analysis shows under allocation from June to September'17 with the exception of WAR Band 01
- 05B % error included for comparison

Rec Duration in Days	05B	05W01	05W02	05W03	05W04
<31 days	23%	37%	35%	33%	34%
31 to 180	69%	60%	62%	64%	62%
181 to 365	6%	3%	3%	3%	4%
>365	2%	0%	0%	0%	0%

Strand 4 – Reconciliation Analysis: WAR Bands (Band 06)

Reconciliation % Error - GY 2016/17 (All 13 LDZs)

Ldz Identifier

Sum of %Error

Y-axis: % Error (Deemed - Actual), from -25% to 10%

X-axis: Reconciliation Variance Month — 2017_6, 2017_7, 2017_8, 2017_9

Rec Var Year_Month

EUC_Band legend:
- 06B
- 06W01
- 06W02
- 06W03
- 06W04
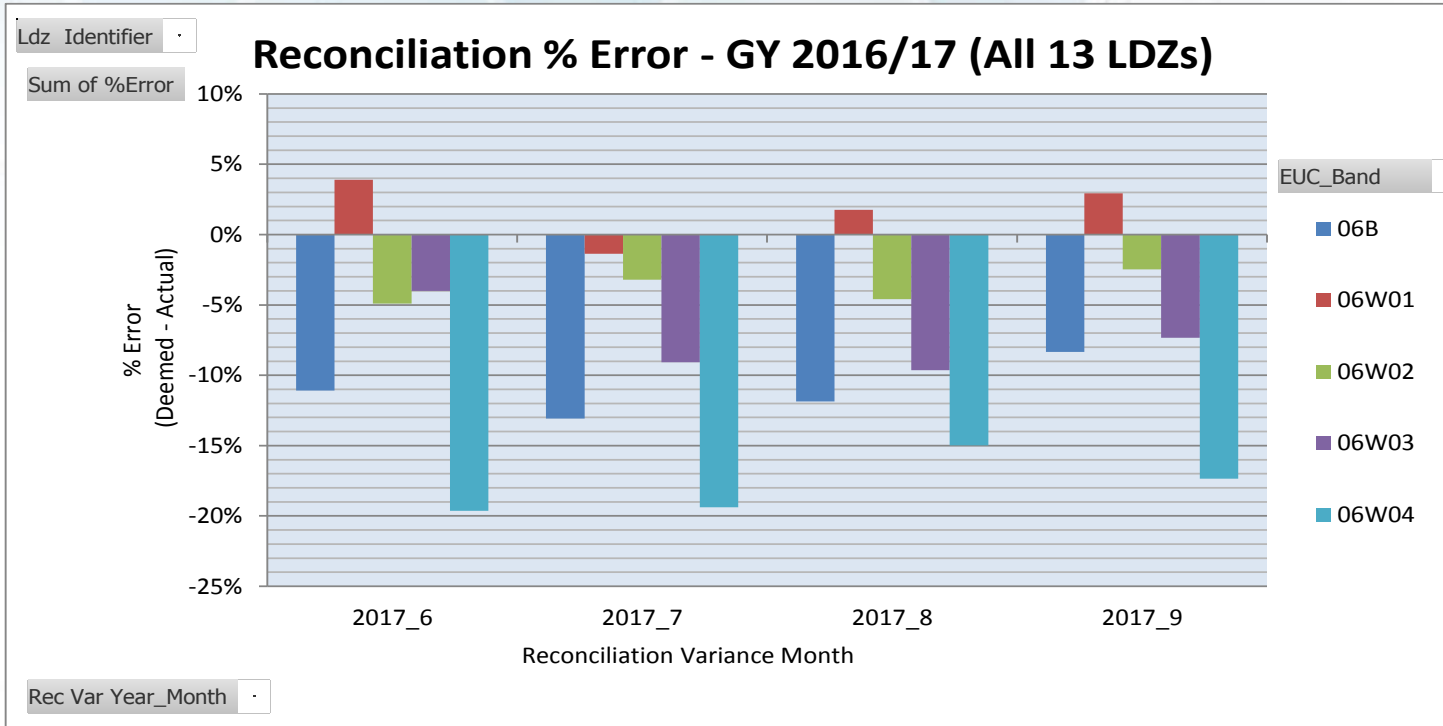
% Error Range (all days)		
Band	Min	Max
06B	-13.1%	-8.3%
06W01	-1.4%	3.9%
06W02	-4.9%	-2.5%
06W03	-9.6%	-4.0%
06W04	-19.6%	-15.0%

- Band 06 WAR analysis shows under allocation with the exception of WAR Band 01 in Jun'17, Aug'17 & Sep'17
- 06B % error included for comparison

Rec Duration in Days	06B	06W01	06W02	06W03	06W04
<31 days	21%	41%	42%	33%	39%
31 to 180	71%	58%	53%	63%	57%
181 to 365	6%	2%	4%	4%	5%
>365	1%	0%	0%	0%	0%

Strand 4 – Reconciliation Analysis: WAR Bands (Band 07)

Reconciliation % Error - GY 2016/17 (All 13 LDZs)

Ldz Identifier

Sum of %Error

EUC_Band
- 07B
- 07W01
- 07W02
- 07W03
- 07W04

Y-axis: % Error (Deemed - Actual), from 10% to -25%

X-axis: Reconciliation Variance Month — 2017_6, 2017_7, 2017_8, 2017_9

Rec Var Year_Month
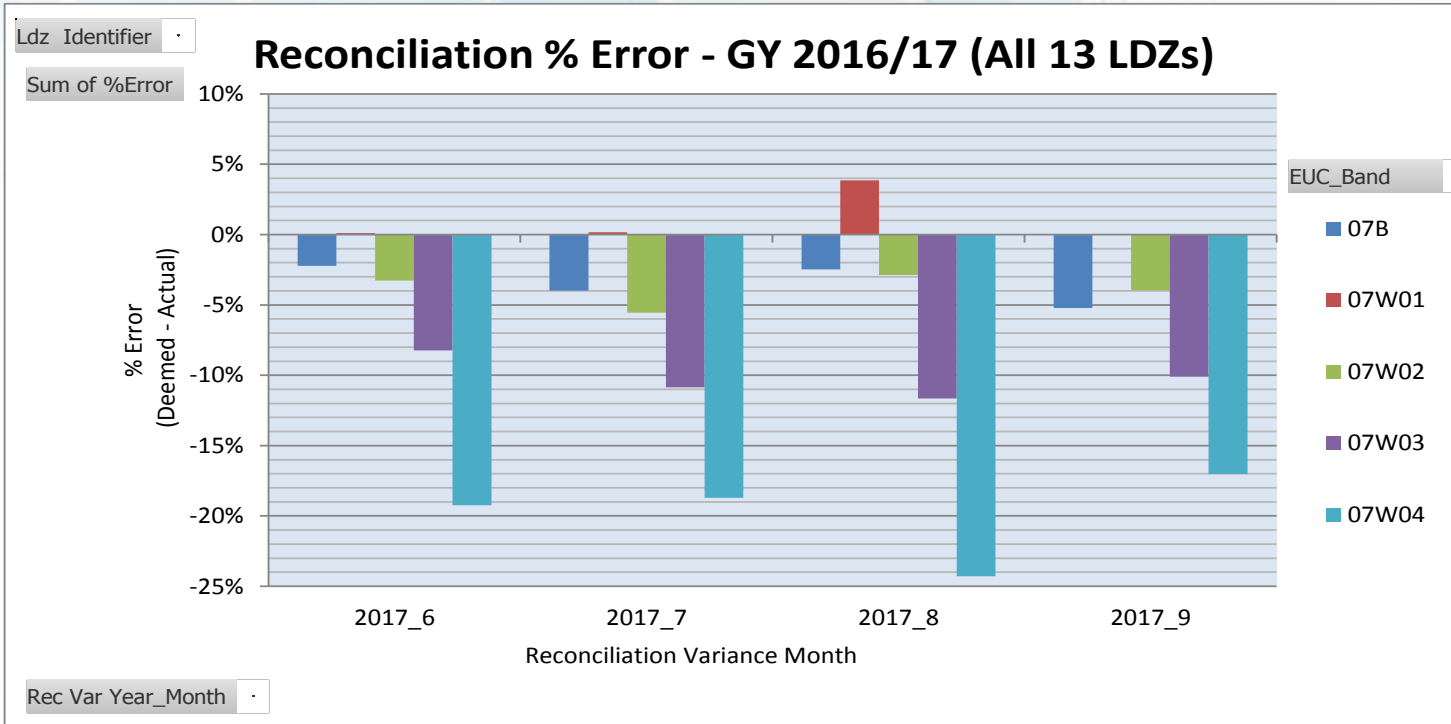
% Error Range (all days)		
Band	Min	Max
07B	-5.2%	-2.2%
07W01	0.0%	3.9%
07W02	-5.5%	-2.9%
07W03	-11.6%	-8.2%
07W04	-24.3%	-17.0%

- Band 07 WAR analysis shows under allocation with the exception of WAR Band 01
- 07B % error included for comparison

Rec Duration in Days	07B	07W01	07W02	07W03	07W04
<31 days	24%	33%	44%	34%	19%
31 to 180	64%	66%	51%	62%	73%
181 to 365	8%	2%	6%	4%	7%
>365	4%	0%	0%	0%	1%

Strand 4 – Reconciliation Analysis: WAR Band (Band 08)

Reconciliation % Error - GY 2016/17 (All 13 LDZs)

Ldz Identifier

Sum of %Error

Rec Var Year_Month

EUC_Band
- 08B
- 08W01
- 08W02
- 08W03
- 08W04
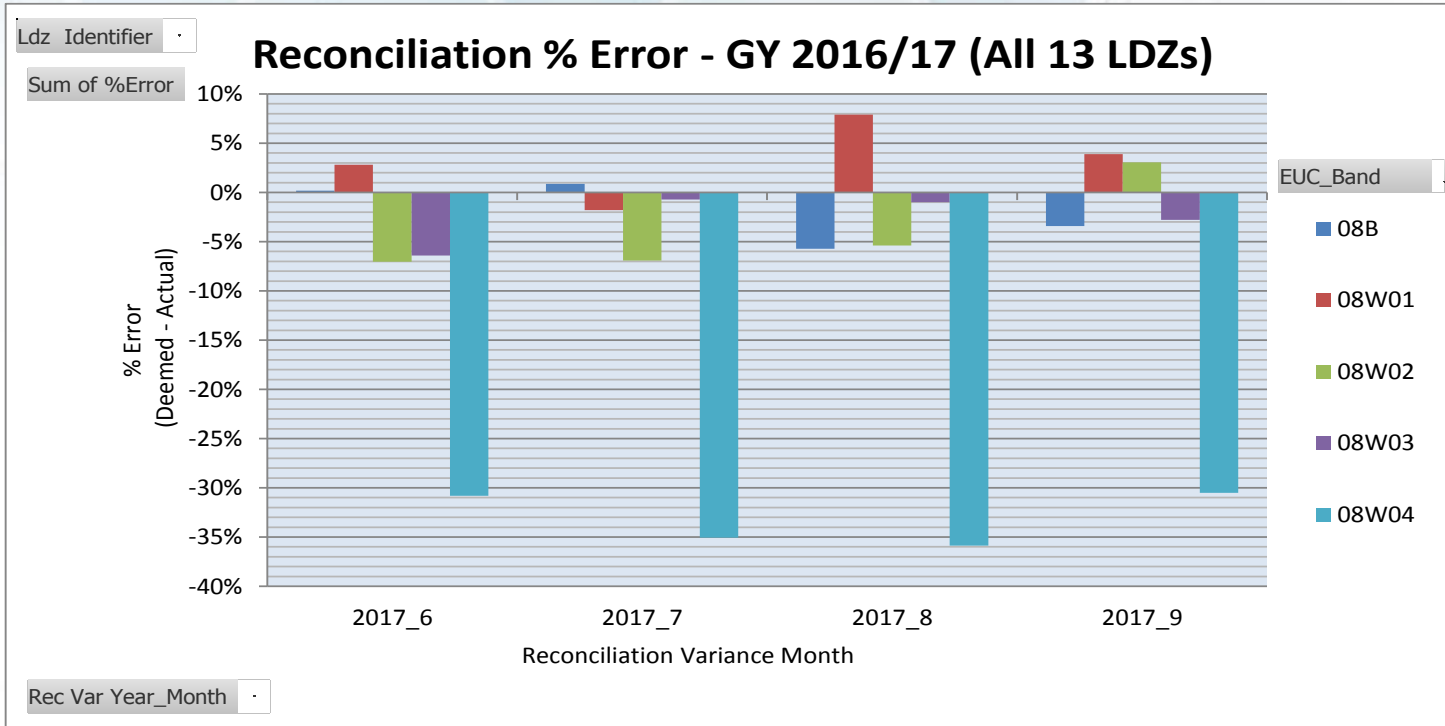
% Error Range (all days)		
Band	Min	Max
08B	-5.7%	0.9%
08W01	-1.8%	7.9%
08W02	-7.0%	3.1%
08W03	-6.4%	-0.7%
08W04	-35.9%	-30.5%

■ Band 08 WAR analysis shows under allocation with the exception of WAR Band 01 in Jun'17, Aug'17 & Sep'17 and WAR Band 02 in Sep'17

Rec Duration in Days	08B	08W01	08W02	08W03	08W04
<31 days	21%	71%	39%	49%	5%
31 to 180	76%	29%	61%	49%	86%
181 to 365	3%	0%	0%	2%	10%
>365	0%	0%	0%	0%	0%

Strand 4 – Reconciliation Analysis: Conclusions

Conclusions:

- Bucket band (02B to 08B) analysis shows a clear tendency for the NDM Algorithm to under allocate during the months of June to September'17 (the exception being in Band 08B)

- WAR Band 1 (in most cases) shows smaller errors across Bands 03 to 08 than WAR Bands 2, 3 and 4 (most likely due to this band being less weather sensitive – i.e. more predictable)
- WAR Band 1 analysis across Bands 03 to 08 suggests that the NDM Algorithm has a tendency to slightly over allocate during the months of June to September'17

- In contrast, analysis of WAR Bands 2, 3 & 4 across Bands 03 to 08 shows under allocation by the NDM Algorithm in all but one month/band combination during the months of June to September'17

Future Analysis:

- Invite DESCs feedback on alternative approach to Strand 4 for Gas Year 2017/18 which will be looked at later this year

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