

**METER ERROR REPORT****FINAL**

Reconcile?	Y
------------	---

Safety Issue?	Y/N
---------------	-----

Thesis Report No.	
-------------------	--

**1. EXECUTIVE SUMMARY**

SITE NAME	Aylesbeare	
LDZ	SW	
START DATE (actual)		
LAST GOOD DATE	14 <sup>th</sup> March 2013	
END DATE	24 <sup>th</sup> June 2014	
SIZE OF ERROR (No reconciliation required if under 0.1%)	0.3551% under-registration (6.26 GWh)	
ESTIMATE – Y/N?		
ROOT CAUSE	Failed validation checks for pressure ADC and temperature ADC on both streams.	
ANALYSIS	Recalculation of volumes using corrected pressure and temperature	
METER TYPE	USM	
AUTHOR	C Jones	
CHECKED BY	H Richardson	
ACCEPTED BY WWU NETWORK		
RECONCILIATION	Distribution	Transportation

## 2. BACKGROUND

Aylesbeare has a duty/standby Ultrasonic meter stream using a gas chromatograph for CV determination and PTZ correction.

During the annual validation the CP4a (ADC Pressure Check) and the CP4e (ADC Temperature Check) tests failed on 25<sup>th</sup> February 2014 for both streams.

The annual validation of stream A took place on 13<sup>th</sup> March 2013. On 27<sup>th</sup> March 2013 the annual validation took place for stream B. Stream B was in use from this date until 26<sup>th</sup> February 2014 then stream A was in use until the end of the error.

## 3. ERROR QUANTIFICATION AND IMPACT

The pressure measurements were corrected for 'As Found' errors shown in Table 1 for Stream A and Table 2 for Stream B when the recorded measurement was in the appropriate range.

The temperature measurements were corrected for the 'As Found' errors shown in Table 3 for Stream A and Table 4 for Stream B when the recorded measurement was in the appropriate range.

Pressure (barg)	CP4a Error (% span)	CP10 Error (% span)	Combined Error (% span)
0	0.011	0.01565	0.02665
25	0.952	0.01295	0.96495
50	-0.14	0.01655	-0.12345
75	-0.231	-0.02365	-0.25465
100	-0.441	-0.03565	-0.47665

Table 1 – Pressure Errors, Stream A (14/03/13 – 27/03/13)

Pressure (barg)	CP4a Error (% span)	CP10 Error (% span)	Combined Error (% span)
0	-0.05	0.0094	-0.0406
25	-0.082	-0.0028	-0.0848
50	-0.152	0.00065	-0.15135
75	-0.287	-0.01155	-0.29855
100	-0.52	0.00755	-0.51245

Table 2 – Pressure Errors, Stream B (28/03/13 – 24/06/14)

Temperature (°C)	CP4e Error (% span)	CP10 Error (% span)	Combined Error (% span)
-10	0	-0.05315	-0.05315
2.5	0.08	-0.09065	-0.01065
15	0.12	-0.05625	0.06375
27.5	0.10	-0.1125	-0.0125
40	0.02	-0.125	-0.105

Table 3 – Temperature Errors, Stream A (14/03/13 – 27/03/13)

Temperature (°C)	CP4e Error (% span)	CP10 Error (% span)	Combined Error (% span)
-10	0	-0.06255	-0.06255
2.5	0.08	-0.09065	-0.01065
15	0.14	-0.06255	0.07745
27.5	0.14	-0.1094	0.0306
40	0.02	-0.025	-0.005

Table 4 – Temperature Errors, Stream B (28/03/13 – 24/06/14)

The density, flow rate and daily volumes were recalculated from the corrected pressure and temperature readings. The error was calculated on a daily basis as the difference between volume totals using measured and corrected inputs.

The overall error is an under-registration of 0.3551%. The error is equivalent to 6.26 GWh.

#### 4. CAUSES

Pressure ADC checks and temperature ADC check checks failed during routine validation for both streams.

#### 5. RECOMMENDATIONS AND LEARNING

Failures of this type will occur occasionally, if the same checks fail regularly then it suggests a fundamental problem with the equipment being tested and repairs or replacements should be made.

The start of the error cannot be identified therefore the total error to be reconciled should be halved in accordance with the Offtake Arrangements Document. Appendix A shows the daily correction factors, which have already been halved from 14<sup>th</sup> March 2013 to 25<sup>th</sup> February 2014.

**REFERENCES**

Aylesbeare\_Data.xlsx – calculation spreadsheet

Aylesbeare\_Summary.xlsx – results spreadsheet

**VERSION HISTORY**

<i>Version</i>	<i>Changes</i>	<i>Author</i>	<i>Date</i>
<i>0</i>	<i>Original</i>	<i>C.Jones</i>	

**DISTRIBUTION**

*Wales and West Utilities*

**APPENDIX A – Daily Correction Factors**

The table below gives the daily correction factors which should be used to reconcile the error.

<b>Gas Day</b>	<b>Daily Correction Factor</b>
14/03/2013	1.001634
15/03/2013	1.001694
16/03/2013	1.001616
17/03/2013	1.001506
18/03/2013	1.001572
19/03/2013	1.001511
20/03/2013	1.001477
21/03/2013	1.001255
22/03/2013	1.000834
23/03/2013	1.001643
24/03/2013	1.001563
25/03/2013	1.001517
26/03/2013	1.001591
27/03/2013	1.001632
28/03/2013	1.001866
29/03/2013	1.001832
30/03/2013	1.001922
31/03/2013	1.002044
01/04/2013	1.001842
02/04/2013	1.001893
03/04/2013	1.001981
04/04/2013	1.002011
05/04/2013	1.002021
06/04/2013	1.001912
07/04/2013	1.001845
08/04/2013	1.001767
09/04/2013	1.001838
10/04/2013	1.001857
11/04/2013	1.001938
12/04/2013	1.001814
13/04/2013	1.001923
14/04/2013	1.001969
15/04/2013	1.001855
16/04/2013	1.001863
17/04/2013	1.001944
18/04/2013	1.001977
19/04/2013	1.001947
20/04/2013	1.001935

<b>Gas Day</b>	<b>Daily Correction Factor</b>
21/04/2013	1.001873
22/04/2013	1.001829
23/04/2013	1.001912
24/04/2013	1.001812
25/04/2013	1.001759
26/04/2013	1.001818
27/04/2013	1.001933
28/04/2013	1.001766
29/04/2013	1.001785
30/04/2013	1.001783
01/05/2013	1.001865
02/05/2013	1.001863
03/05/2013	1.001844
04/05/2013	1.001933
05/05/2013	1.001922
06/05/2013	1.001859
07/05/2013	1.001787
08/05/2013	1.001845
09/05/2013	1.001874
10/05/2013	1.001801
11/05/2013	1.001993
12/05/2013	1.001808
13/05/2013	1.001833
14/05/2013	1.001784
15/05/2013	1.001792
16/05/2013	1.001813
17/05/2013	1.001950
18/05/2013	1.002058
19/05/2013	1.002123
20/05/2013	1.001955
21/05/2013	1.001816
22/05/2013	1.001797
23/05/2013	1.001780
24/05/2013	1.001757
25/05/2013	1.001908
26/05/2013	1.002002
27/05/2013	1.002026
28/05/2013	1.001839

29/05/2013	1.001798
30/05/2013	1.001889
31/05/2013	1.001866
01/06/2013	1.001813
02/06/2013	1.001866
03/06/2013	1.001861
04/06/2013	1.001818
05/06/2013	1.001754
06/06/2013	1.001779
07/06/2013	1.001772
08/06/2013	1.001781
09/06/2013	1.001758
10/06/2013	1.001743
11/06/2013	1.001751
12/06/2013	1.001749
13/06/2013	1.001773
14/06/2013	1.001770
15/06/2013	1.001778
16/06/2013	1.001785
17/06/2013	1.001766
18/06/2013	1.001769
19/06/2013	1.001781
20/06/2013	1.001770
21/06/2013	1.001816
22/06/2013	1.001910
23/06/2013	1.001870
24/06/2013	1.001874
25/06/2013	1.001880
26/06/2013	1.001841
27/06/2013	1.001823
28/06/2013	1.001805
29/06/2013	1.001874
30/06/2013	1.001874
01/07/2013	1.001857
02/07/2013	1.001826
03/07/2013	1.001844
04/07/2013	1.001908
05/07/2013	1.001863
06/07/2013	1.001842
07/07/2013	1.001824
08/07/2013	1.001847
09/07/2013	1.001866
10/07/2013	1.001911
11/07/2013	1.001852
12/07/2013	1.001839
13/07/2013	1.001804

14/07/2013	1.001863
15/07/2013	1.001865
16/07/2013	1.001972
17/07/2013	1.001988
18/07/2013	1.001918
19/07/2013	1.001932
20/07/2013	1.001981
21/07/2013	1.002032
22/07/2013	1.001957
23/07/2013	1.001871
24/07/2013	1.001963
25/07/2013	1.001862
26/07/2013	1.001977
27/07/2013	1.001906
28/07/2013	1.001941
29/07/2013	1.001946
30/07/2013	1.001923
31/07/2013	1.001958
01/08/2013	1.001976
02/08/2013	1.001989
03/08/2013	1.001988
04/08/2013	1.002002
05/08/2013	1.002002
06/08/2013	1.001952
07/08/2013	1.001928
08/08/2013	1.002007
09/08/2013	1.002056
10/08/2013	1.002003
11/08/2013	1.002006
12/08/2013	1.002005
13/08/2013	1.001974
14/08/2013	1.001978
15/08/2013	1.002014
16/08/2013	1.001995
17/08/2013	1.001996
18/08/2013	1.001952
19/08/2013	1.001931
20/08/2013	1.001932
21/08/2013	1.001985
22/08/2013	1.001935
23/08/2013	1.001948
24/08/2013	1.001934
25/08/2013	1.001951
26/08/2013	1.001951
27/08/2013	1.001950
28/08/2013	1.001964

29/08/2013	1.001955
30/08/2013	1.001946
31/08/2013	1.001935
01/09/2013	1.001956
02/09/2013	1.001955
03/09/2013	1.001959
04/09/2013	1.001952
05/09/2013	1.001958
06/09/2013	1.001959
07/09/2013	1.001993
08/09/2013	1.002011
09/09/2013	1.001951
10/09/2013	1.001982
11/09/2013	1.001983
12/09/2013	1.001986
13/09/2013	1.001950
14/09/2013	1.001932
15/09/2013	1.001933
16/09/2013	1.001944
17/09/2013	1.001910
18/09/2013	1.001906
19/09/2013	1.001965
20/09/2013	1.001906
21/09/2013	1.001978
22/09/2013	1.001954
23/09/2013	1.001935
24/09/2013	1.001950
25/09/2013	1.001934
26/09/2013	1.001890
27/09/2013	1.001924
28/09/2013	1.001954
29/09/2013	1.001943
30/09/2013	1.001941
01/10/2013	1.001896
02/10/2013	1.001968
03/10/2013	1.001987
04/10/2013	1.001888
05/10/2013	1.001952
06/10/2013	1.001976
07/10/2013	1.001920
08/10/2013	1.001942
09/10/2013	1.001981
10/10/2013	1.001981
11/10/2013	1.001867
12/10/2013	1.001904
13/10/2013	1.001889

14/10/2013	1.001811
15/10/2013	1.001852
16/10/2013	1.001871
17/10/2013	1.001931
18/10/2013	1.001903
19/10/2013	1.001929
20/10/2013	1.001978
21/10/2013	1.001865
22/10/2013	1.001921
23/10/2013	1.001907
24/10/2013	1.001860
25/10/2013	1.001984
26/10/2013	1.001953
27/10/2013	1.001943
28/10/2013	1.001805
29/10/2013	1.001825
30/10/2013	1.001785
31/10/2013	1.001903
01/11/2013	1.001821
02/11/2013	1.001811
03/11/2013	1.001826
04/11/2013	1.001840
05/11/2013	1.001798
06/11/2013	1.001944
07/11/2013	1.001815
08/11/2013	1.001818
09/11/2013	1.001819
10/11/2013	1.001921
11/11/2013	1.001821
12/11/2013	1.001810
13/11/2013	1.001772
14/11/2013	1.001779
15/11/2013	1.001783
16/11/2013	1.001876
17/11/2013	1.001846
18/11/2013	1.001887
19/11/2013	1.001828
20/11/2013	1.001793
21/11/2013	1.001822
22/11/2013	1.001900
23/11/2013	1.001947
24/11/2013	1.001953
25/11/2013	1.001870
26/11/2013	1.001830
27/11/2013	1.001831
28/11/2013	1.001866

29/11/2013	1.001874
30/11/2013	1.001800
01/12/2013	1.001895
02/12/2013	1.001831
03/12/2013	1.001879
04/12/2013	1.001921
05/12/2013	1.001803
06/12/2013	1.001844
07/12/2013	1.001912
08/12/2013	1.001873
09/12/2013	1.001859
10/12/2013	1.001817
11/12/2013	1.001827
12/12/2013	1.001952
13/12/2013	1.001977
14/12/2013	1.001936
15/12/2013	1.001996
16/12/2013	1.001920
17/12/2013	1.001812
18/12/2013	1.001831
19/12/2013	1.001885
20/12/2013	1.001848
21/12/2013	1.001900
22/12/2013	1.001909
23/12/2013	1.001829
24/12/2013	1.001942
25/12/2013	1.001953
26/12/2013	1.001853
27/12/2013	1.001913
28/12/2013	1.001903
29/12/2013	1.001893
30/12/2013	1.001924
31/12/2013	1.001958
01/01/2014	1.001970
02/01/2014	1.001912
03/01/2014	1.001912
04/01/2014	1.001828
05/01/2014	1.001855
06/01/2014	1.001891
07/01/2014	1.001931
08/01/2014	1.001916
09/01/2014	1.001990
10/01/2014	1.001838
11/01/2014	1.001896
12/01/2014	1.001852
13/01/2014	1.001856

14/01/2014	1.001865
15/01/2014	1.001948
16/01/2014	1.001943
17/01/2014	1.001825
18/01/2014	1.001880
19/01/2014	1.001862
20/01/2014	1.001820
21/01/2014	1.001856
22/01/2014	1.001892
23/01/2014	1.001896
24/01/2014	1.001896
25/01/2014	1.001941
26/01/2014	1.001869
27/01/2014	1.001898
28/01/2014	1.001887
29/01/2014	1.001864
30/01/2014	1.001791
31/01/2014	1.001894
01/02/2014	1.001907
02/02/2014	1.001892
03/02/2014	1.001825
04/02/2014	1.001859
05/02/2014	1.001859
06/02/2014	1.001862
07/02/2014	1.001966
08/02/2014	1.001849
09/02/2014	1.001827
10/02/2014	1.001834
11/02/2014	1.001863
12/02/2014	1.001907
13/02/2014	1.001895
14/02/2014	1.001843
15/02/2014	1.001851
16/02/2014	1.001851
17/02/2014	1.001915
18/02/2014	1.001949
19/02/2014	1.001947
20/02/2014	1.001874
21/02/2014	1.001912
22/02/2014	1.001902
23/02/2014	1.001900
24/02/2014	1.001876
25/02/2014	1.001878
26/02/2014	1.003344
27/02/2014	1.003192
28/02/2014	1.001942



01/03/2014	1.002673
02/03/2014	1.003271
03/03/2014	1.003108
04/03/2014	1.003283
05/03/2014	1.003161
06/03/2014	1.003190
07/03/2014	1.003253
08/03/2014	1.003193
09/03/2014	1.003144
10/03/2014	1.002567
11/03/2014	1.002875
12/03/2014	1.003127
13/03/2014	1.002846
14/03/2014	1.003104
15/03/2014	1.003264
16/03/2014	1.003291
17/03/2014	1.003261
18/03/2014	1.003308
19/03/2014	1.003305
20/03/2014	1.003154
21/03/2014	1.003133
22/03/2014	1.003094
23/03/2014	1.003116
24/03/2014	1.003158
25/03/2014	1.002802
26/03/2014	1.003140
27/03/2014	1.003090
28/03/2014	1.003168
29/03/2014	1.003229
30/03/2014	1.003173
31/03/2014	1.002490
01/04/2014	1.002892
02/04/2014	1.003133
03/04/2014	1.003012
04/04/2014	1.002985
05/04/2014	1.002791
06/04/2014	1.002991
07/04/2014	1.003012
08/04/2014	1.003211
09/04/2014	1.003028
10/04/2014	1.002951
11/04/2014	1.002914
12/04/2014	1.003098
13/04/2014	1.003127
14/04/2014	1.003158
15/04/2014	1.003080

16/04/2014	1.003043
17/04/2014	1.003055
18/04/2014	1.002678
19/04/2014	1.002928
20/04/2014	1.002944
21/04/2014	1.003110
22/04/2014	1.003020
23/04/2014	1.003124
24/04/2014	1.003095
25/04/2014	1.003023
26/04/2014	1.003055
27/04/2014	1.002881
28/04/2014	1.002708
29/04/2014	1.003010
30/04/2014	1.002993
01/05/2014	1.003068
02/05/2014	1.002969
03/05/2014	1.003006
04/05/2014	1.003136
05/05/2014	1.003226
06/05/2014	1.003197
07/05/2014	1.003176
08/05/2014	1.003006
09/05/2014	1.003197
10/05/2014	1.003211
11/05/2014	1.003216
12/05/2014	1.003041
13/05/2014	1.003134
14/05/2014	1.003177
15/05/2014	1.003109
16/05/2014	1.003164
17/05/2014	1.003200
18/05/2014	1.003244
19/05/2014	1.003383
20/05/2014	1.003316
21/05/2014	1.003284
22/05/2014	1.003241
23/05/2014	1.003258
24/05/2014	1.003329
25/05/2014	1.003332
26/05/2014	1.003260
27/05/2014	1.003084
28/05/2014	1.003073
29/05/2014	1.003170
30/05/2014	1.003183
31/05/2014	1.003203

01/06/2014	1.003227
02/06/2014	1.001639
03/06/2014	1.003117
04/06/2014	1.003136
05/06/2014	1.003174
06/06/2014	1.003093
07/06/2014	1.003155
08/06/2014	1.003145
09/06/2014	1.003166
10/06/2014	1.003208
11/06/2014	1.003123
12/06/2014	1.003179
13/06/2014	1.003190
14/06/2014	1.003207
15/06/2014	1.003226
16/06/2014	1.003125
17/06/2014	1.003151
18/06/2014	1.003101
19/06/2014	1.003217
20/06/2014	1.003148
21/06/2014	1.003152
22/06/2014	1.003196
23/06/2014	1.003270
24/06/2014	1.003109