

METER ERROR REPORT**FINAL**

Reconcile?	Y
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Safety Issue?	N
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Thesis Report No.	
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1. EXECUTIVE SUMMARY

SITE NAME	Coldstream	
LDZ	NO	
START DATE (actual)	2018	
LAST GOOD DATE	26 th September 2017	
END DATE	24 th September 2018	
SIZE OF ERROR (No reconciliation required if under 0.1%)	0.53% over read / (169497 sm ³ / 1.845GWh)	
ESTIMATE – Y/N?	Y	
ROOT CAUSE	Low range differential pressure transmitter failed validation.	
ANALYSIS	In the attached spreadsheets	
METER TYPE	Orifice	
AUTHOR	Piers Eldridge	
CHECKED BY	Catherine Jones	
ACCEPTED BY NGN NETWORK		
RECONCILIATION	Distribution	Transportation

2. BACKGROUND

Gas is supplied to part of the Northern Network at Coldstream FWACV offtake. The site comprises one orifice plate metering system. The meter system uses a GasPT for CV determination and PTZ correction.

During the annual validation the CP11a check (low range differential pressure transmitter) failed on 24th September 2018 and subsequently passed following re-calibration.

3. ERROR QUANTIFICATION AND IMPACT

The differential pressure measurement was corrected for the 'As Found' errors shown in Table 1 when the recorded measurement was in the appropriate range. The low flow cutoff differential pressure was assumed to be 0.15 mbar.

The differential pressure measurement has been corrected for as found error recorded at the September 2018 validation between 26th September 2017 and 24th September 2018. As the start of the differential pressure transmitter error cannot be determined the half the error has been applied to the period between the validations.

Measured pressure (mbar)	Error (% span)	Error (mbar)
0.000	0.599	0.300
10.010	0.648	0.324
25.020	0.650	0.325
35.030	0.658	0.329
50.050	0.660	0.330

Table 1 – Differential pressure As Found errors (13th September 2018)

The mass flow rate equation (1) was rearranged in equation 2 to give a correction factor $\frac{q_{mc}}{q_{mi}}$ where q_{mc} is the correct mass flow rate, q_{mi} is the incorrect mass flow rate, ΔP_c is the corrected differential pressure and ΔP_m is the measured differential pressure.

$$q_m = \frac{C}{\sqrt{1-\beta^4}} \varepsilon \frac{\pi}{4} d^2 \sqrt{2\Delta P \rho} \quad - (1)$$

$$\frac{q_{mc}}{q_{mi}} = \frac{\sqrt{\Delta P_c}}{\sqrt{\Delta P_m}} \quad - (2)$$

This method ignores the negligible decrease in the upstream temperature correction that would be caused by a differential pressure approximately 0.3 mbar less than the recorded differential pressure.

The correction factor was calculated for each DANINT cycle and applied to the recorded LGT flowrate to calculate a corrected flowrate. The error for each DANINT cycle was calculated by taking the difference between the volumes

calculated by multiplying the LGT flow rate and the corrected flow rate by the time between each DANINT cycle.

The overall error is an over-registration of 0.53 %. The error is equivalent to 1.84 GWh

4. CAUSES

The low range differential pressure transmitter check failed during routine validation.

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.

REFERENCES

MER.xls

VERSION HISTORY

<i>Version</i>	<i>Changes</i>	<i>Author</i>	<i>Date</i>
<i>0</i>	<i>First draft</i>	<i>Piers Eldridge</i>	<i>28/01/2019</i>
<i>1</i>	<i>Final</i>	<i>Piers Eldridge</i>	<i>04/02/2019</i>
<i>2</i>	<i>NGN comments are included</i>	<i>Piers Eldridge</i>	<i>05/02/2019</i>

DISTRIBUTION

Asset Owner
Energy Performance
Network Lead Group
Asset Strategy

Appendix A

Date	Correction factor
26-Sep-17	0.99540
27-Sep-17	0.99625
28-Sep-17	0.99531
29-Sep-17	0.99453
30-Sep-17	0.99490
01-Oct-17	0.99376
02-Oct-17	0.99512
03-Oct-17	0.99620
04-Oct-17	0.99666
05-Oct-17	0.99592
06-Oct-17	0.99651
07-Oct-17	0.99233
08-Oct-17	0.99479
09-Oct-17	0.99468
10-Oct-17	0.99528
11-Oct-17	0.99488
12-Oct-17	0.99649
13-Oct-17	0.99457
14-Oct-17	0.99262
15-Oct-17	0.99297
16-Oct-17	0.99505
17-Oct-17	0.99570
18-Oct-17	0.99537
19-Oct-17	0.99370
20-Oct-17	0.99318
21-Oct-17	0.99377
22-Oct-17	0.99527
23-Oct-17	0.99500
24-Oct-17	0.99373
25-Oct-17	0.99523
26-Oct-17	0.99611
27-Oct-17	0.99669
28-Oct-17	0.99614
29-Oct-17	0.99514
30-Oct-17	0.99570
31-Oct-17	0.99596
01-Nov-17	0.99520
02-Nov-17	0.99586
03-Nov-17	0.99460
04-Nov-17	0.99551
05-Nov-17	0.99725

06-Nov-17	0.99789
07-Nov-17	0.99709
08-Nov-17	0.99687
09-Nov-17	0.99730
10-Nov-17	0.99664
11-Nov-17	0.99761
12-Nov-17	0.99807
13-Nov-17	0.99763
14-Nov-17	0.99713
15-Nov-17	0.99748
16-Nov-17	0.99739
17-Nov-17	0.99773
18-Nov-17	0.99678
19-Nov-17	0.99801
20-Nov-17	0.99765
21-Nov-17	0.99659
22-Nov-17	0.99669
23-Nov-17	0.99686
24-Nov-17	0.99786
25-Nov-17	0.99858
26-Nov-17	0.99794
27-Nov-17	0.99703
28-Nov-17	0.99770
29-Nov-17	0.99741
30-Nov-17	0.99886
01-Dec-17	0.99832
02-Dec-17	0.99742
03-Dec-17	0.99726
04-Dec-17	0.99636
05-Dec-17	0.99735
06-Dec-17	0.97752
07-Dec-17	0.99769
08-Dec-17	0.99863
09-Dec-17	0.99885
10-Dec-17	0.99927
11-Dec-17	0.99914
12-Dec-17	0.99131
13-Dec-17	0.99822
14-Dec-17	0.99774
15-Dec-17	0.99870
16-Dec-17	0.99859
17-Dec-17	0.99832
18-Dec-17	0.99755
19-Dec-17	0.99626
20-Dec-17	0.99727

21-Dec-17	0.99766
22-Dec-17	0.99763
23-Dec-17	0.99546
24-Dec-17	0.99284
25-Dec-17	0.98908
26-Dec-17	0.99867
27-Dec-17	0.99817
28-Dec-17	0.99859
29-Dec-17	0.99779
30-Dec-17	0.99774
31-Dec-17	0.99721
01-Jan-18	0.99750
02-Jan-18	0.99765
03-Jan-18	0.99321
04-Jan-18	0.99717
05-Jan-18	0.99785
06-Jan-18	0.99822
07-Jan-18	0.99625
08-Jan-18	0.99855
09-Jan-18	0.99801
10-Jan-18	0.99777
11-Jan-18	0.99761
12-Jan-18	0.99640
13-Jan-18	0.99742
14-Jan-18	0.99756
15-Jan-18	0.99758
16-Jan-18	0.99876
17-Jan-18	0.99786
18-Jan-18	0.99820
19-Jan-18	0.99878
20-Jan-18	0.99904
21-Jan-18	0.99913
22-Jan-18	0.99802
23-Jan-18	0.99727
24-Jan-18	0.99742
25-Jan-18	0.99774
26-Jan-18	0.99742
27-Jan-18	0.99475
28-Jan-18	0.99693
29-Jan-18	0.99738
30-Jan-18	0.99656
31-Jan-18	0.99791
01-Feb-18	0.99770
02-Feb-18	0.99816
03-Feb-18	0.99790

04-Feb-18	0.99783
05-Feb-18	0.99831
06-Feb-18	0.99782
07-Feb-18	0.99898
08-Feb-18	0.99840
09-Feb-18	0.99817
10-Feb-18	0.99782
11-Feb-18	0.99707
12-Feb-18	0.99847
13-Feb-18	0.99890
14-Feb-18	0.99890
15-Feb-18	0.99797
16-Feb-18	0.99701
17-Feb-18	0.99761
18-Feb-18	0.99803
19-Feb-18	0.99686
20-Feb-18	0.99702
21-Feb-18	0.99639
22-Feb-18	0.99844
23-Feb-18	0.99895
24-Feb-18	0.99741
25-Feb-18	0.99759
26-Feb-18	0.99804
27-Feb-18	0.99908
28-Feb-18	0.99976
01-Mar-18	0.99992
02-Mar-18	0.99937
03-Mar-18	0.99844
04-Mar-18	0.99889
05-Mar-18	0.99846
06-Mar-18	0.99842
07-Mar-18	0.99703
08-Mar-18	0.99645
09-Mar-18	0.99755
10-Mar-18	0.99500
11-Mar-18	0.99481
12-Mar-18	0.99655
13-Mar-18	0.99546
14-Mar-18	0.99746
15-Mar-18	0.99813
16-Mar-18	0.99863
17-Mar-18	0.99909
18-Mar-18	0.99916
19-Mar-18	0.99845
20-Mar-18	0.99738

21-Mar-18	0.99676
22-Mar-18	0.99611
23-Mar-18	0.99728
24-Mar-18	0.99652
25-Mar-18	0.99617
26-Mar-18	0.99718
27-Mar-18	0.99748
28-Mar-18	0.99733
29-Mar-18	0.99711
30-Mar-18	0.99604
31-Mar-18	0.99868
01-Apr-18	0.99791
02-Apr-18	0.99893
03-Apr-18	0.99794
04-Apr-18	0.99795
05-Apr-18	0.99800
06-Apr-18	0.99741
07-Apr-18	0.99578
08-Apr-18	0.99557
09-Apr-18	0.99585
10-Apr-18	0.99463
11-Apr-18	0.99732
12-Apr-18	0.99771
13-Apr-18	0.99762
14-Apr-18	0.99529
15-Apr-18	0.99233
16-Apr-18	0.99416
17-Apr-18	0.99435
18-Apr-18	0.99428
19-Apr-18	0.99085
20-Apr-18	0.98371
21-Apr-18	0.99180
22-Apr-18	0.99266
23-Apr-18	0.99365
24-Apr-18	0.99453
25-Apr-18	0.99271
26-Apr-18	0.99565
27-Apr-18	0.99458
28-Apr-18	0.99470
29-Apr-18	0.99427
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01-May-18	0.99509
02-May-18	0.99626
03-May-18	0.99537
04-May-18	0.99028

05-May-18	0.98958
06-May-18	0.99119
07-May-18	0.98924
08-May-18	0.98243
09-May-18	0.99017
10-May-18	0.98546
11-May-18	0.99273
12-May-18	0.99280
13-May-18	0.99107
14-May-18	0.99135
15-May-18	0.98433
16-May-18	0.99117
17-May-18	0.99241
18-May-18	0.99205
19-May-18	0.98869
20-May-18	0.97904
21-May-18	0.98899
22-May-18	0.99176
23-May-18	0.97894
24-May-18	0.99417
25-May-18	0.98916
26-May-18	0.98927
27-May-18	0.99221
28-May-18	0.99107
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30-May-18	0.99325
31-May-18	0.98544
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03-Jun-18	0.98962
04-Jun-18	0.99358
05-Jun-18	0.98826
06-Jun-18	0.99123
07-Jun-18	0.99215
08-Jun-18	0.98937
09-Jun-18	0.99157
10-Jun-18	0.97514
11-Jun-18	0.99269
12-Jun-18	0.99200
13-Jun-18	0.99131
14-Jun-18	0.99196
15-Jun-18	0.98688
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19-Jun-18	0.99121
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29-Jun-18	0.98537
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03-Jul-18	0.99194
04-Jul-18	0.98183
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06-Jul-18	0.97535
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12-Jul-18	0.98231
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23-Sep-18	0.99435