



Measurement Error Report

Cadent Gas Ltd

MER_CAD_213_22 Lower Quinton

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1 Revision Control

Rev	Issue date	Description	Prep.	App.
1	21/02/2022	Issued for comment	BK	DS
2	23/02/2022	Final	BK	DS
2.1	11/05/2022	Revised Final	BK	DS

2 Executive Summary

Site Name	Lower Quinton
DNO	Cadent Gas Limited
LDZ	West Midlands
Error Start Date	Circa 2012
(Or) Last Good Date	
Error Corrected Date	2 nd November 2021
Size of Error (over or under read)	25,557 Sm ³ over-registration (approximately 0.276 GWh)
Error Description	Incorrect K-factors on calibration certificate
Methodology	Recalculation of flow readings using correct K-factors
Meter Type	Ultrasonic meter
MER Unique Reference Number	-
Cadent Internal Reference	MER/CAD/213/22

3 Error Description

Lower Quinton has two 16" Daniel 3400 series ultrasonic meter streams that operate in a duty/standby arrangement for measurement of gas through the offtake from the National Transmission System to the Local Distribution Zone.

Volume pulse output meters (such as turbine or ultrasonic meters) use a K-factor to correct for errors in the meter output determined during calibration. This is implemented in the flow computer using piecewise linear interpolation of data in a lookup table of frequencies and corresponding K-factors.

Following recalibration of Stream B ultrasonic meter (Serial No. 03-130054) in 2012 the flow computer data was updated to match the DNVGL Flow Centre Calibration Certificate No. 09023.

In November 2021, in the process of creating a new flow computer configuration it was noted that the K-factors presented on the Stream B calibration certificate were incorrect with virtually no correction being applied for the errors in the meter output determined during calibration. The site meter streams were swapped at 10am on 2nd November 2021 to flow on Stream A until the flow computer could be updated with the corrected values. The certificate was re-issued as Certificate No. 09023-1 with corrected K-factors and these values were entered into the flow computer on 1st December 2021.

Table 1 compares the original and corrected certificate K-factor values. Table 2 demonstrates the original and corrected values implemented in the flow computer.

Frequency Hz	K-Factor pulses/m ³	
	Original Certificate No. 09023	Corrected Certificate No. 09023-1
177.8271	1870.09969	1866.03589
239.8924	1870.09707	1868.86761
447.4518	1870.10078	1869.49914
478.6570	1870.09988	1873.68140
969.1718	1870.1004	1866.02536
1203.9185	1870.10072	1865.61792
1625.0796	1870.10046	1871.11248
1942.2274	1870.09965	1867.09539
3416.7145	1870.09975	1870.30937
5059.7304	1870.09987	1875.29089

Table 1 - Original and Corrected Certificate K-factor Values

Frequency Hz	K-Factor pulses/m ³	
	Incorrect Flow Computer Entry	Corrected Flow Computer Entry
178	1870.100	1866.035
240	1870.097	1868.868
447	1870.100	1869.499
479	1870.100	1873.681
969	1870.100	1866.025
1204	1870.100	1865.618
1625	1870.100	1871.112
1942	1870.100	1867.095
3417	1870.100	1870.309
5060	1870.100	1875.291

Table 2 - Original and Corrected Flow Computer K-factor Entries

4 Methodology

The corrected K-factor was calculated on a 4-minutely basis based on the measured frequency and the corrected K-factor data. Two sets of Standard volume daily totals were calculated: one using the erroneous K-factor and another using the corrected K-factor, the error being the difference between the two.

5 Error Quantification

Due to the positive and negative nature of the Stream B ultrasonic meter performance determined during calibration, many of the errors cancel each other out leading to overall daily errors below the reconciliation threshold ($<\pm 0.1\%$ of daily volume). The total reconcilable error is estimated to be an over-registration of 25,557 Sm³. The error should be corrected using the daily correction factors in Appendix A.

6 Learning

It is recommended that meter calibrations are witnessed to ensure the calibration is carried out correctly and the data presented on the certificate is correct. Where this is not feasible, the data should be verified before it is implemented on site. Where a meter is recalibrated, the data should also be compared to the previous calibration data.

7 References

MARQUIS data files

Gemini Daily Data

MER_CAD_213_22_Lower_Quinton_Data_2021.xlsx - Calculation Data spreadsheet

MER_CAD_213_22_Lower_Quinton_Data_2020.xlsx - Calculation Data spreadsheet

MER_CAD_213_22_Lower_Quinton_Data_2019.xlsx - Calculation Data spreadsheet

MER_CAD_213_22_Lower_Quinton_Data_Summary R2.1.xlsx - Calculation Data spreadsheet

8 Appendix A – Daily Correction Factors

The error should be corrected using the Daily Correction Factors applied to the Gemini Daily Volume as detailed below.

Gas Day	Gemini Volume (MSm ³)	Daily Correction Factor
09-Apr-19	1.949	0.998700
10-Apr-19	2.081	0.998944
11-Apr-19	1.885	0.998679
13-Apr-19	2.000	0.998707
14-Apr-19	2.070	0.998919
15-Apr-19	1.572	0.998753
29-May-19	0.828	1.001394
11-Jun-19	1.123	0.998866
19-Aug-19	1.606	0.998437
20-Aug-19	1.672	0.998513
21-Aug-19	1.674	0.998590
22-Aug-19	1.598	0.998490
23-Aug-19	0.728	0.998316
27-Aug-19	0.000	1.002178
28-Aug-19	3.835	1.001675
29-Aug-19	3.790	1.001248
30-Aug-19	3.810	1.001806
31-Aug-19	3.614	1.002146
01-Sep-19	4.064	1.001692
09-Sep-19	6.114	1.001473
10-Sep-19	5.719	1.001228
15-Sep-19	1.420	1.001123
08-Oct-19	1.627	0.998810
20-Dec-19	1.780	0.998934
21-Dec-19	1.900	0.998763
22-Dec-19	1.899	0.998862
26-Dec-19	1.900	0.999000
27-Dec-19	0.365	0.998801
14-Jan-20	1.899	0.998819
17-Jan-20	1.998	0.998962
25-Jan-20	1.898	0.998814
24-Feb-20	2.446	1.001015
11-May-20	0.036	0.998455
23-Sep-20	0.146	0.998821
25-Sep-20	0.144	0.998470
29-Oct-20	0.720	1.001081
28-Dec-20	0.212	0.998619

Gas Day	Gemini Volume (MSm ³)	Daily Correction Factor
10-Jan-21	1.999	0.998677
13-Jan-21	1.988	0.998789
14-Jan-21	2.132	0.998924
16-Jan-21	1.998	0.998890
19-Jan-21	1.699	0.998343
20-Jan-21	1.699	0.998537
02-Feb-21	1.950	0.998723
03-Feb-21	1.899	0.998601
04-Feb-21	1.895	0.998641
06-Feb-21	1.898	0.998951
15-Feb-21	1.792	0.998498
25-Mar-21	1.799	0.998897
17-Apr-21	1.600	0.998694
18-Apr-21	0.011	0.998297
07-May-21	1.699	0.998573
08-May-21	0.003	1.002178
19-May-21	0.610	1.001560
26-May-21	0.062	0.998841
23-Jun-21	1.698	0.998563
24-Jun-21	1.698	0.998628
25-Jun-21	1.779	0.998835
26-Jun-21	1.694	0.998859
08-Jul-21	1.848	0.998805
09-Jul-21	1.798	0.998560
10-Jul-21	1.599	0.998597
12-Jul-21	1.599	0.998360
13-Jul-21	0.798	0.998333
13-Aug-21	0.751	1.001625
14-Aug-21	3.401	1.002326
15-Aug-21	3.431	1.002198