Measurement Error Report

Orbital Gas Systems

MER_CAD_274_23 Attleborough BNEF

Document Reference: NK3225T-001

Client Reference: 197253

Document Author: Will Davies

Contact: Will.Davies@kelton.co.uk

Kelton Engineering Ltd
The Mackenzie Building, 168 Skene Street
Aberdeen, AB10 1PE, Scotland, UK
t: +44 (0) 1224 630000 | f: +44 (0) 1224 630004
e: info@kelton.co.uk | w: www.kelton.co.uk

Contents

1 Revision Control

Rev	Issue date	Description	Prep.	App.
1	18/03/24	Issued for comment	WD	TB

2 Executive Summary

Site Name	Attleborough BNEF
DNO	CADENT
LDZ	
Error Start Date	28th December 2023
(Or) Last Good Date	
Error Corrected Date	3rd January 2024
Size of Error (over or under read)	2575 Sm^3 over registration (77.08 GWh)
Error Description	False Zero flow readings on Fiscal meter
Methodology	Danint data analysis
Meter Type	Ultrasonic meter
MER Unique Reference Number	
Cadent Internal Reference	MER/CAD/274/23

Average Flow Rates (mcm/day)	0.00042526
Declared Volume of Error (mcm)	0.00002300
Estimated Quantity of Error (GWh)	0.00126907
Estimated Significance	Low
Over or Under Read?	Under Read

3 Error Description

Attleborough BNEF operated by Eco Verde Energy has a single flow meter stream for measurement of gas exiting the grid entry unit (GEU) and entering the distribution network (referred to in this report as 'Fiscal USM'). A second flow meter is located on the inlet to the GEU for process control (referred to in this report as 'Inlet USM'). Propane injection is used to control the gas properties (e.g. calorific value, Wobbe number, etc.) to meet the requirements of the Gas Safety (Management) Regulations (GS(M)R). Gas that is not within specification is rejected by a diverter valve. During normal operation the Fiscal USM will read slightly higher than the Inlet USM due to the addition of propane.

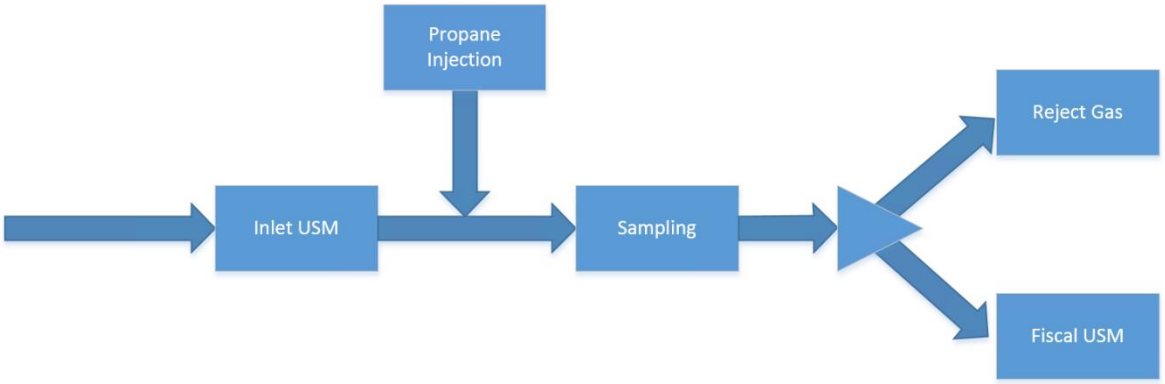

Figure 1 - Grid Entry Unit Flow Diagram

Errors were reported on the following days:

- 28/12/2023 10:27
- 03/01/2024 11:43

It should be noted that analysis of the initial error period shows no noticeable mismeasurement. Danint data files were analysed from start of gas day 28/12/2023 through to end of gas day 03/01/2024. The data shows the meter to be offline from 10:27 on the gas day 28/12/2023 until 11:43 on gas day 03/01/2024.
None of the Danint data files show any evidence that this meter was flowing during the proposed error period.

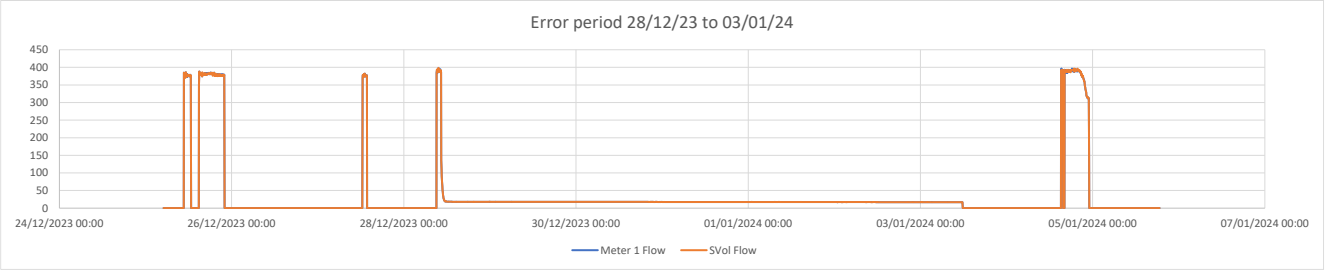

Figure 2 Meter volume flowrate for Fiscal 28/12/23 to 03/01/24

It is also worth noting that the Danint 'V03' data files that would normally show updated frequency, K-Factor, pressure, temperature and density at each GC cycle seem to be corrupted. The timestamp and associated metering data is only updating for each new day as oppose to (roughly) every 4 minutes.

4 Methodology

Over the period of interest, the flowrates on the fiscal meter dropped dramatically, from around 386 Sm³ to approx. 18 Sm³, indicating the meter system had gone into reject mode but was still recording a flow of 18 Sm³. *Note: The switch to reject mode is normally evident from the trends in pressure and temperature; This is found in the V03 data files, as this data is not updating the start of the error period has been taken from the commencement of the flatline flow rate.*

The error consisted of the fiscal meter reading a false flow for a period of 8716 minutes (145.3 hours). Of this error duration the initial 627minutes of gas day 28th December can be attributed to correct flow data. The final 813 minutes of gas day 28th December can be attributed to the false flow reading.

The reported error flowrate continues throughout the period up to 11:43 on the gas day dated 3rd January 2024 at which point during this gas day at around 11:48 the fiscal meter then records the correct zero flow.

As the meter was offline throughout these gas days any reported meter data should be zeroed, but should consider the proportion of flow that was correctly accounted for on the gas day 28th December before the observed false flow error was observed.

The meter appears to come back online for a short period of time on the gas day of the 4th January 2024 at around 15:13.

The calculated error is the sum of the Fiscal Meter total standard volume flow for the affected time period. The calculated standard volume error for each gas day was then subtracted from the relevant gas day calculated daily standard volume total. The calculated energy error is then equated using the calculated standard volume error and the average CV for the error duration.

5 Error Quantification

The total error is estimated to be an overall over registration of 2,575.00 Sm³, (77.08GJ).

Of this 366Sm³ (12.67 GJ) is the proportion of false flow observed on gas day 28/12/23 from 10:27 through to 29/12/23 05:00. Of the gas days that follow on up to 11:43 on 3rd January 2024, these contribute to the overall over registration of flow stated above.

These Svol values are calculated from the Danint meter data between the observed times, the energy is then calculated using the CV value as reported at the end-of-day.

The Gemini data is data that is corrected by CADENT for estimated error measurements. In the case of the gas day 28/12/2023 Gemini data for the energy value over corrected the estimated error by approximately 13.51%, hence the correction factor applied in table 2 leading to an under registration in the daily Gemini Billed Data.

All of the gas days that followed up to 3rd January were false flow readings and as such Gemini data has correctly corrected these to 0.00 (see Appendix A)

Gas Day	Estimated Volume over read (Sm^3)	Estimated Energy over read (GJ)
28-Dec-2023	366	12.67
29-Dec-2023	428	16
30-Dec-2023	424	16
31-Dec-2023	416	15
1-Jan-2024	417	15
2-Jan-2024	409	15
3-Jan-2024	114	5

Table 1 – DANINT reported values for gas days during error period.

The calculated data is detailed in the accompanying document "Attleborough MER calculation R1".

6 Learning

It is suspected that contamination on the ultrasonic meter transducers originating from the propane injection system has caused the meter to read erroneously. Ongoing early testing suggests this may be a result of the transportation/bunkering methods. It is recommended considering additional liquid filtration on the propane injection line and/or additional filtration on the propane tank outlet. Consideration should be given to implementing a live comparison between the non-Fiscal meters (inlet + propane) and the Fiscal meter to give early warning of any measurement error.

7 References

Attleborough Danint files
MER Attleborough R1 Calculation spreadsheet

Appendix A – Daily Correction Factors

The error should be corrected using the Daily Correction Factors applied to the Gemini Daily Energy totals as detailed below. The Daily Correction Factor is the ratio of the estimated energy to the Latest Gemini Reported energy for each respective gas day.

Gas Day	Gemini Reported Daily Energy (kWh)	Daily Correction Factor
28/12/23	4973	1.13506822
29/12/23	0	0.00
30/12/23	0	0.00
31/12/23	0	0.00
01/01/24	0	0.00
02/01/24	0	0.00
03/01/24	0	0.00

Table 2 – Daily Energy correction factors for the periods of mismeasurement