



Measurement Error Report

Northern Gas Networks

NO-019 MER Pickering Feb 2024

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1 Revision Control

Rev	Issue date	Description	Prep.	App.
1	08/02/2024	Issued for comment	TB	MN

2 Executive Summary

Site Name	Pickering
DNO	Northern Gas Networks
LDZ	North East
Error Start Date(s)	13/02/2024
(Or) Last Good Date	
Error Corrected Date	15/02/2024
Size of Error (over or under read)	80152 Sm ³ under registration (3282.5 GJ)
Error Description	Erroneous readings on Fiscal meter
Methodology	Danint data analysis & recalculation
Meter Type	Orifice Plate
MER Unique Reference Number	
NGN Internal Reference	NO-019

Average Flow Rates (mcm/day)	0.042047
Declared Volume of Error (mcm)	0.080153
Estimated Quantity of Error (GWh)	0.911828
Estimated Significance	Low
Over or Under Read?	Under

3 Error Description

Pickering Offtake has a single flow meter stream for gas measurement. This consists of a single 100% orifice plate with low and high range, and Standby DP transmitters. Along with pressure, temperature and gas chromatograph instrumentation. During routine ME2 maintenance checks the pressure transmitter was inadvertently re-ranged from 0-80 barg to 0-62 barg, likely whilst attempting to put the pressure reading into a Keypad/Override value of 62 barg. This caused an erroneous low pressure value for the duration this transmitter had the incorrect range in use. This resulted in incorrect line density and compressibility which led to incorrect flow rate calculation for this duration.

The transmitter had the incorrect range in-use for the following duration:

- 13/02/2024 11:42 to 15/02/2024 09:27; total of error period of 2745 minutes.

As part of the ME2 checks the orifice plate was changed out on 14/02/2024, between 09:44 and 11:04. The meter stream was offline for a total of 80 minutes for this task, where a genuine zero flow was recorded through the meter stream. Where applicable the below details were used:

All flow calculations prior to 14/02/24 @ 09:44 used the old plate details of 105.1992mm @ 20.4°C. As well as fixed values of 1.3476 for isentropic exponent and 1.22E-05 Pa/s for viscosity.

All flow calculations after to 14/02/24 @ 11:04 used the new plate details of 105.1143mm @ 21.1°C. As well as the updated fixed values of 1.3385 for isentropic exponent and 1.21E-05 Pa/s for viscosity.

4 Methodology

ME2 results and Danint data files were obtained from NGN. From this data it can be seen the reported pressure was incorrect during the error period as listed above. Firstly, the reported pressure was multiplied by a ratio of 80/62 to correct for the error period. It can be seen in the Danint data files that for the initial part of the error, roughly 48 minutes from 11:42 on 13/02/24, the DP readings default to Keypad (20 mbar). This was followed by 84 minutes of missing data. For the purposes to calculating the mismeasurement totals the last good DP values have been used for this time period (24.238628 mbar).

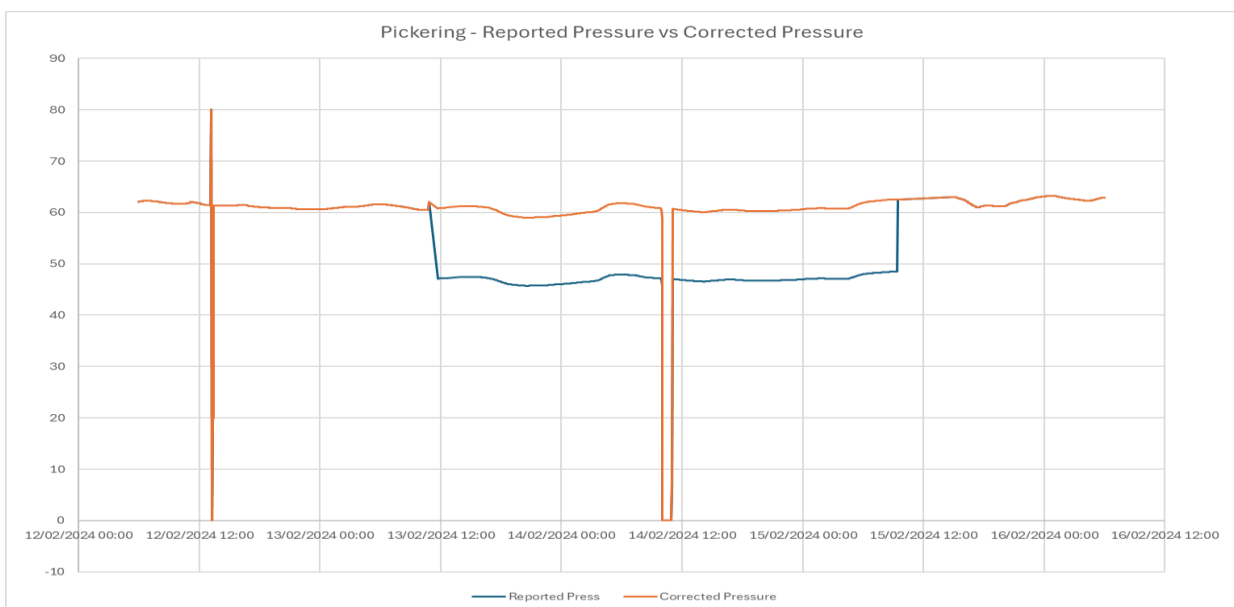


Figure 1 – Reported and corrected pressure for error period

Next the reported line density was recalculated from the corrected pressure using AGA8:1994.

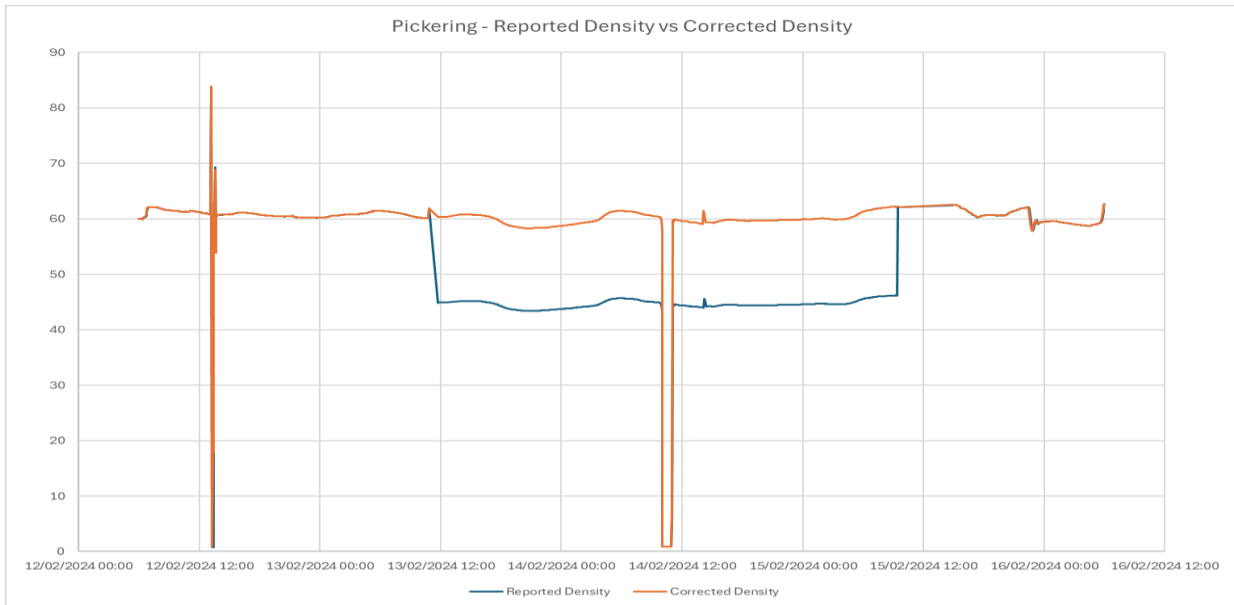


Figure 2 – Reported and corrected line density for error period

Next the Sv_{ol} and Energy flowrates could be recalculated using the corrected pressure and density values. As mentioned in section 3, flow before the orifice changeout was calculated using the old orifice plate details, serial number 161/2, with details from DNV certificate number 16503; 'd' of 105.1992mm @ 20.4°C. Flowrates after the plate change were calculated using the new orifice plate details, serial number 161/3, with details from DNV certificate number 17103; 'd' of 105.1143mm @ 21.1°C. The pipe diameter, 'D', was taken from the flow computer at a greater resolution than the DNV certificates; 153.9018mm as opposed to 153.902mm (both @ 20°C).

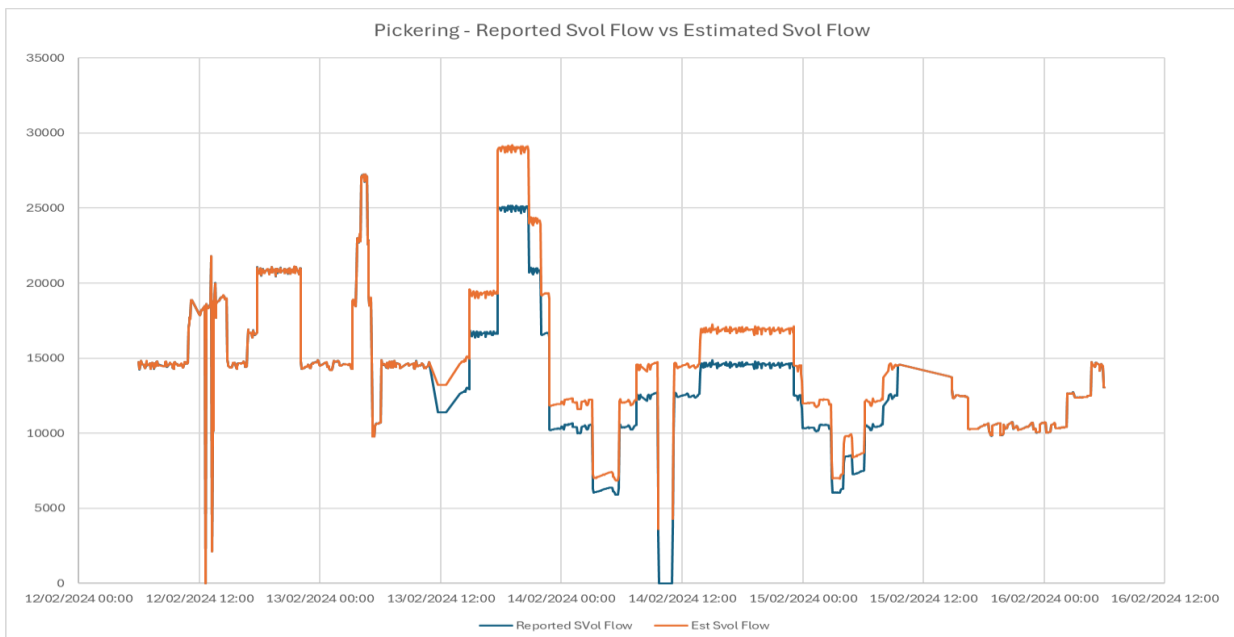


Figure 3 – Reported and estimated SvOl flow rate for error period

5 Error Quantification

From the reported and calculated flowrates, the reported and corrected daily totals were calculated, the difference between the two is the error values for each day. The table below shows the total error estimated to be an overall under registration of 95993.8 Sm³, (3810 GJ) when compared with the Danint Reported flow.

Gas Day	Daily Volume (Sm ³)		
	Using Danint Reported Flow	Using Calculated Flow	Estimated Error
13-Feb-2024	349545.187	394465.787	44920.600
14-Feb-2024	274335.878	318028.267	43692.389
15-Feb-2024	277170.297	284551.066	7380.769

Table 1 – Standard Volume daily totals calculated vs Danint

However, the daily Billed Data as provided by NGN shows slight differences to the Danint reported daily totals. This may be down to timing/resolution/rounding during telemetry data transfer, all daily values compare to within <6%.

The estimated error when compared to the NG daily billed data is as shown in table 2 below. As such, the Svoll error within the NGN Billed data is estimated to be overall under registration of 80152.5 Sm³, (3282.5 GJ). The error values from Table 2 should be added to the NGN Billed daily values using the daily correction factors found in Appendix A of this report.

Gas Day	Daily Volume (Sm ³)		
	Using NGN Billed Daily Totals	Using Calculated Flow	Estimated Error
13-Feb-2024	355107.275	394465.787	39358.513
14-Feb-2024	290867.929	318028.267	27160.339
15-Feb-2024	270917.375	284551.066	13633.690

Table 2 – Standard Volume daily totals calculated vs NGN Billed values

The NGN Billed data was provided in terms of Energy in kWh. Table 3 below references the estimated errors in Energy terms (converted into GJ).

Gas Day	Daily Volume (GJ)		
	Using NGN Billed Daily Totals	Using Calculated Flow	Estimated Error
13-Feb-2024	14427.400	16026.871	1599.471
14-Feb-2024	11815.960	12919.188	1103.229
15-Feb-2024	10893.089	11472.971	579.882

Table 3 – Energy daily totals calculated vs NGN Billed values

The calculated data is detailed in the accompanying document “NO-019 Pickering MER NK3154U R1”.

6 Learning

Additional care should be taken to ensure correct settings are used when taking instrumentation in/out of Keypad/Override mode. Training should be provided where necessary to ensure all technicians are fully competent, and comfortable, with performing such tasks.

7 References

Pickering Danint files

MER calc data; NO-019 Pickering MER NK3154U R1

NTSEnergyOfftakePickeringNELDZOfftake_13-022024_15-02-2024

Pickering ME2 Annual 12.02.24 5500108501 DW

Calculation spreadsheet

NGN Billed daily values

ME2 Validation Results

Appendix A – Daily Correction Factors

The error should be corrected using the Daily Correction Factors applied to the NGN Billed data. This data is provided in kWh and has been converted to GJ within the referenced MER calculation spreadsheet.

The Daily Correction Factor is the ratio of the estimated energy to the Latest Billed energy for each respective gas day.

Gas Day	Reported (Billed) Daily Energy (kWh)	Estimated Daily Energy (kWh)	Daily Correction Factor
13 January 2024	4,007,611	4,451,909	1.110863
14 January 2024	3,282,211	3,588,663	1.093368
15 January 2024	3,025,858	3,186,936	1.053234

Table 4 – Daily Energy correction factors for the periods of mismeasurement