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CONTENTS

- 1.0 INTRODUCTION
- 2.0 TECHNICAL QUALIFICATIONS & RESPONSES

1.0 INTRODUCTION

This document details the responses of the Appointed Independent Technical Expert (ITE) to Technical Qualifications submitted by British Gas in reference to the SMER Draft Report (KELTON® report reference NK3173-003) dated 22/11/2010 and a summary presentation given to the UNC Offtake Arrangements Workgroup (via teleconference) on the 30th November 2010.

At a meeting of the UNC Offtake Arrangements Workgroup on 25th January 2011, a number of the British Gas Technical Qualifications were discussed.

From these discussions it appeared that a key issue was the way in which the results set seen for the low flow testing had been incorporated within the results table and whether the "potential" of a small bias of -0.4% in this low flow region should be recognised and assigned its dedicated correction factor.

In the opinion of the ITE, whilst there may be a potential for a small bias on the low flow results, the combined tests results of all flow rates (high, medium and low) fall with the limits of the test environment uncertainty expectations ($\pm 2\%$ for flows between 30-100% of design range and $\pm 3.5\%$ for flows $>30\%$). For this reason, the ITE recommends that a single correction factor is applied to the SMER period quantities as stated within the draft report.

As a point of note (and to highlight the significance), if the low flow results were to be treated separately, this would actually increase the correction factor applied to the high and medium flow bands (which contribute to typically $>90\%$ of the SMER) to 1.693 (an increase of 0.36%) and decrease the correction factor applied to the low flow band to 1.676 (a decrease of 0.66%). This would therefore result in a slight "increase" in the overall SMER quantities.

To repeat the position of the ITE as summarised within the meeting of the 25th January 2011, it is recommended that the conclusions of the draft report are accepted by the representatives of the Workgroup without change or additional data.

Section 2.0 is structured to;

1. Provide the Draft Report and presentation reference(s) for which the Technical Qualification refers.
2. The Technical Qualification itself (cut & pasted exactly as received) from British Gas (highlighted in light blue text).
3. The associated response by the Independent Technical Expert (highlighted in block capital italics in dark blue text).

2.0 TECHNICAL QUALIFICATIONS & RESPONSES

Overview of key principle issues with the Braishfield B SMER draft report

British Gas Comments;

Due to the magnitude and value of the error it is expected that all of data used to derive the data would be presented to ensure transparency. Instead only some of the information is presented and other information is not.

ITE RESPONSE; WITH RESPECT, IT IS IMPOSSIBLE FOR ME INCLUDE ALL OF THE DATA I HAVE REVIEWS DURING THIS INVESTIGATION WITHIN A REPORT – I HAVE SPENT MANY, MANY DAYS EXAMINING SPREADSHEETS, SITE REPORTS & MUCH SUPPORTING DATA PROVIDED BY THE TRANSPORTER(S).

I HAVE (IN MY OPINION) INCLUDED THE RELEVANT DATA FROM (AND LET'S BE HONEST - A VERY SIMPLE RECREATION OF THE ERROR) TO PROVIDE TRANSPARENCY TO MY TECHNICAL INVESTIGATIONS IN ACCORDANCE WITH THE ITE GUIDELINES.

To minimise the uncertainty in such calculation of errors then where possible the data must be used to maximise granularity and avert increased uncertainty arising from over simplification which can result in a simpler calculation process but with a higher uncertainty.

ITE RESPONSE; THE UNCERTAINTY OF THE TESTING IS "AS NEAR" TO THE UNCERTAINTY AT THE TIME OF THE SMER PERIOD. IN MY OPINION THERE IS NO ADDITIONAL (OR HIGHER) UNCERTAINTY GENERATED BY THE TESTING THAN THAT SEEN DURING THE SMER.

Although an empirical method is used to derive the error no attempt has been made to validate this method against the actual data held prior to, during and post the event. This lack of comparisons and cross checking means the evaluation of the SMER is not as robust as it could be.

ITE RESPONSE; WITH THE GREATEST OF RESPECT THIS COULDN'T BE FURTHER FROM THE TRUTH. I FULLY RECOGNISE THE IMPORTANCE TO "CROSS CHECK" MY CONCLUSIONS WHICH I SPENT MUCH TIME IN DOING. FROM THE MASSES OF SPREADSHEETS GENERATED BY THE TRANSPORTER(S), I SAW ENOUGH SUPPORTING DATA TO SATISFY MY CONCLUSIONS WHICH WERE ACCEPTED ACCORDINGLY BY THE TRANSPORTER REPRESENTATIVES DURING THE WORKGROUP MEETING.

Presentation page 5 and SMER report page 6

British Gas Comment;

The information presented is inconsistent. For both the start and stop of the SMER period but the data log as shown for the SMER start should be presented for the SMER Finish. The technician's log as shown for the SMER finish should also be shown for the start of the SMER period.

2.0 TECHNICAL QUALIFICATIONs & RESPONSES

ITE RESPONSE; IN MY OPINION, THE EXAMPLES CHOSEN DEMONSTRATE BEYOND DOUBT WHEN THE SMER WAS FIRST CREATED & WHEN IT WAS FINALLY CLEARED. A MIXTURE OF GRAPHICAL & LOG BOOK ENTRIES REMOVES ANY COMMON MODE RECORD ISSUES.

Presentation page 6 and SMER report page 3 paragraph 4 and page 15

British Gas Comment;

Whilst the approach used by the ITE is a practical approach, this as a result carries a higher uncertainty. However, the opportunity has not been taken to validate the outcome against the actual data and information which is independent. The empirical findings must be validated against existing network data records including any information available from shippers, this approach will result in a truly robust evaluation.

ITE RESPONSE; AGAIN, I CONFIRM THAT I HAVE SPENT MUCH TIME IN REVIEWING NETWORK DATA & FROM THE "MANY" SPREADSHEETS & MONITORING DATA REVIEWED, I AM HAPPY THAT THEY SUPPORT THE MAGNITUDE OF MY CONCLUSIONS.

Presentation page 7 and SMER report page 4 paragraphs 2 and 3 and page 15

British Gas Comment;

The flow rate is not that constant as shown from the data points, this information should also be shown as time based rather than just the data point count of 16000, details on time span per data point or number of points over a day.

The pressure is also erratic so this may lead to preferential flow changes through the open valve which may be erratic as the line pressure is balanced by flow changes.

ITE RESPONSE;

FLOW RATE;

YES THE FLOW RATE IS NOT CONSTANT AS IT IS THE OPERATING FLOW RATE SEEN DURING THE TIME OF THE SMER. THIS IS WHY EACH OF THE 4 SITE VISIT TESTS WERE DONE AT 3 DIFFERENT FLOW RATES (SEE DRAFT REPORT PAGE 16) TO ENSURE THAT THE ERROR WAS NOT FLOW RATE DEPENDENT AND AS CAN BE SEEN FROM THE TEST GRAPHS (POTENTIAL OF A SMALL BIAS AT LOW FLOW RATES EXCLUDED). IT ISN'T.....!!

GRAPH AXIS;

THE GRAPHS ARE TIME BASED – FOR 0 THINK 26TH JANUARY 7 FOR 16000 THINK 26TH APRIL.....!!

2.0 TECHNICAL QUALIFICATIONs & RESPONSES

PRESSURE:

AS I'VE EXPLAINED FOR FLOW RATE PREVIOUSLY, IT IS NOT CONSTANT AS IT IS THE OPERATING PRESSURE SEEN DURING THE TIME OF THE SMER. THIS IS WHY EACH OF THE 4 SITE VISIT TESTS WERE DONE AT A DIFFERENT PRESSURE (SEE PAGE 16) TO ENSURE THE ERROR WAS NOT PRESSURE DEPENDENT AND AS CAN BE SEEN FROM THE TEST GRAPHS. IT ISN'T.....!!

Presentation page 8 and SMER report page 15 figure 5.1.2

British Gas Comment;

For the SMER evaluation procedures to establish the effect of the valve opening, this empirical procedure is very open to variations in flow rate during the test itself as changes in flow will affect the results.

ITE RESPONSE: I ACKNOWLEDGE THIS AND THAT IS WHY I REQUESTED THE TESTS ARE DONE AT DIFFERENT FLOW RATES – THE RESULTS GRAPH FROM EACH SITE TEST SUGGESTS THERE IS NO SIGNIFICANT VARIATIONS.

Presentation page 9 and SMER report page 4 paragraph 5

British Gas Comments;

The report should show all of the results for each of the tests so a comparison can be made by shippers and demonstrates that the tests selected for the correction are suitable.

ITE RESPONSE: IN MY OPINION, THE TEST RESULTS ARE SHOWN FOR ALL THE TESTS WITHIN THE DRAFT REPORT (PAGES 19-27). A SAMPLE OF THE TEST RESULT SPREADSHEET IS ADDITIONALLY INCLUDED WITHIN REPORT APPENDIX B FOR THE TEST COMPLETED DURING 28TH SEPTEMBER.

The table of results shows the effect of valve position and flow rate. It is noted that the flow rate affects the under-reading by around 1% between min and max flow which is in addition to the claimed test result spread.

ITE RESPONSE: IN ISOLATION (i.e. THE RESULTS FROM THE 1ST TEST ON 2ND AUGUST (THE ONE I BELEIVE BG ARE REFERRING TO ON PRESENTION SLIDE 9) THIS MAY APPEAR TO BE THE CASE. IF ALL OF THE TESTS PERFORMED DURING THE 4 SITE VISITS ARE REVIEWED IT CAN BE SEEN THAT THERE IS NO APPARENT (SIGNIFICANT) CORRELATION TO FLOW RATE EFFECTS.

The results presented should be of the lowest uncertainty and free from any bias arising from assumptions made on in the derivation of the errors. In such cases the correction applied to be that with the lowest uncertainty or at the lowest end of the spread otherwise a correction could be applied which has a higher uncertainty and consequently is not equitable. Is there a minimum requirement for the derivation of a SMER correction? What is the estimated uncertainty of this

2.0 TECHNICAL QUALIFICATIONS & RESPONSES

derivation, the data spread error is stated as 1% but what about the other assumptions made such as flow rates?

ITE RESPONSE: LET ME MAKE IT CLEAR – NO ASSUMPTIONS HAVE BEEN MADE WITHIN THIS REVIEW ONLY THE RESULTS OBTAINED DURING THE TESTING HAVE BEEN USED.

THERE IS NO DERIVATION USED OTHER THAN TAKING 2 NUMBERS AWAY FROM EACH OTHER TO CALCULATE A % DIFFERENCE.....!!

Presentation page 10 and SMER report page 29

British Gas Comment;

This is another potential mis-measurement and an over reading for the low range differential pressure cell of 1.8 mbar over its operating range. Error will be in the range of 2-4% (very approximate) for flows of less than approximately 60kSm³/hr, this needs further investigation.

ITE RESPONSE: MY FIRST IMPRESSIONS WERE THAT THIS DID SEEM TO BE A POTENTIAL ISSUE.

HOWEVER, ALL FIELD TRANSMITTERS WERE SUBJECT TO ME2 CALIBRATION CHECKS IN EARLY JANUARY (2010) – AS WE KNOW THE CAUSE OF THIS SMER WAS WHEN THE LOW DP TRANSMITTER WAS REPLACED ON 26TH JANUARY HAVING FAILED THE ME2 REQUIREMENTS. ALL TRANSMITTERS WERE SUBSEQUENTLY REPORTED AS A PASS AND A PRE-TEST (2ND AUGUST) REPEAT ALSO PASSED.

WE NEED TO BE CAREFUL HERE BECAUSE 2 READINGS PRODUCED FROM 2 SEPARATE TRANSMITTERS WILL NEVER READ THE SAME SO, WE NEED TO EXAMINE WHAT LEVEL WE CAN REASONABLY EXPECT THE READINGS TO AGREE TO;

AS THE TRANSMITTERS ARE CALIBRATED TO 0.2% OF THEIR CALIBRATED SPAN (FOR THE HI RANGE = 0-500 mbar) THERE IS STRAIGHT AWAY THE POSSIBILITY THAT THERE WOULD BE A DIFFERENCE OF ±1 mbar. INCLUDE THE ADC CALIBRATION REQUIREMENTS & THE UNCERTAINTY OF THE HIGH DP TX DOWN AT >50 mbar (typically 3-4%) etc. etc.....!!

Presentation page 11 and SMER report page 29 table 7.2.2.

British Gas Comment;

The percentage of error relationship to flow rate is not consistent. It is expected that the effect will be related to flow rate but this is not the case in the table the first and last test have a different relationship of error to flow (error reduces slightly with flow) to the middle two tests.

ITE RESPONSE: IN MY OPINION (AND THE TABULATED RESULTS & RESPONSE GRAPHS WITHIN THE DRAFT REPORT DEMONSTRATE) – THE % ERROR versus FLOW RATE IS VERY MUCH CONSISTENT AND IS SHOWN TO BE SO WITHIN A RESULTS SPREAD OF 1% ON 12 TEST FLOWS BETWEEN 72 & 160 Ksm³/h AND PRESSURES OF BETWEEN 50.7 & 64.3 BarG.

2.0 TECHNICAL QUALIFICATIONs & RESPONSES

THERE IS NO SIGNIFICANT CORRELATION BETWEEN THE RESULTS & THE TEST FLOW AND PRESSURE. THE SPREAD OF THE RESULTS IS THE UNCERTAINTY OF THE TESTING.....!!

Presentation page 12 and SMER report page 30

British Gas Comment;

Exactly how have the effects of flow stability been minimised, this is just a data fix.

ITE RESPONSE: ACTUALLY THE "START to FINISH" FLOW RATE WAS RECORDED AS BEING VERY STABLE IN A NUMBER OF THE TESTS PERFORMED;

TEST #1 (2ND AUGUST) – FOR THE LOW FLOW TEST IT WAS 0.34%, THE MID FLOW TEST 0.47% & THE HIGH FLOW TEST 0.99%.

TEST #2 (28TH SEPTEMBER) – FOR THE LOW FLOW TEST IT WAS 0.47% & THE HIGH FLOW TEST 0.92%.

BUT I WOULD AGREE, THAT IN OTHERS IT IS NOT (AT WORSE CASE 5.4%) AS I'VE ACKNOWLEDGED IN THE DRAFT REPORT SECTION 7.2. THIS IS WHY, IN THE FINAL ERROR CALCULATION (AS I'M 100% CONFIDENT THAT THE EQUALISING VALVE WAS FULLY OPEN), I'VE ONLY USED THE "TEST END" FLOW RATE AS THE "FULLY OPEN" & "TEST END" FLOW VALUES WERE RECORDED WITHIN "MINUTES" OF EACH OTHER & THEREFORE NEGATE THE ISSUES WITH FLOW INSTABILITY OR BIAS.

Presentation page 13 and SMER report pages 29 and 31

British Gas Comment;

Why is an average of the error being applied to each day, as the results have shown that the error varies slightly with flow rate the application of the correction should be based in minimising the uncertainty and reducing bias.

ITE RESPONSE: MY UNDERSTANDING FROM THE ITE GUIDELINES (AS SPECIFIED ON PRESENTATION SLIDE 3 & DRAFT REPORT PAGE 3) IS THAT DAILY CORRECTION IS THE REQUIRED DELIVERABLE.

SMER report page 5 figure 3.1

British Gas Comment;

It states in the error notification that the measurement error was noted by "system operator line pack checks", in which case why was it not noticed earlier. Why has this line pack data not been used to validate the derived data?

ITE RESPONSE: I CONFIRM THAT LINEPACK DATA WAS USED TO SUPPORT MY CONCLUSIONS. IT IS NOT FOR THE ITE TO ANSWER WHY THE ERROR WAS NOT NOTED EARLIER THAN IT WAS.

2.0 TECHNICAL QUALIFICATIONS & RESPONSES

SMER report page 5

British Gas Comment;

The report makes many references to the OPEN equalising valve, only stating the fully open value once on page 6. Confirmation is required that the valve was indeed left fully opened on 26/1/10 and not left partly open.

ITE RESPONSE: IN AN INTERVIEW WITH THE TECHNICIAN WHO DISCOVERED THE OPEN VALVE, HE IS 100% SURE THAT THE VALVE WAS FULLY OPEN.

THIS IS VERY MUCH SUPPORTED PRACTICALLY AS THIS VALVE IS ONLY OPERATED BEFORE AND AFTER ROUTINE CALIBRATION ACTIVITY. IT IS FULLY CLOSED WHEN IN OPERATION & FULLY OPENED WHEN PERFORMING PRE & POST ZERO CHECKS.

SMER report page 6 figure 3.2

British Gas Comments;

Figure 3.2 clearly shows a step change in flow for this ME as a decrease from 3 MSCM/day down to 2.4 MSCM/day and yet this 20% change was not noticed by the operator.

ITE RESPONSE: INFACIT THE GRAPH SHOWS A STEP CHANGE FROM 3.002 MSCM/day DOWN TO TYPICALLY 2.13 MSCM/day (A SHIFT OF 41% - ADDITIONALLY SUPPORTING THE SMER CONCLUSIONS.....!!) – IT IS NOT FOR ME TO COMMENT ON WHY IT WAS NOT IDENTIFIED.....!!

However, it is noted that no such record is shown when the valve was fully closed. This is a significant omission as this information could validate the error as determined by the ITE.

ITE RESPONSE: I DISAGREE IT IS A SIGNIFICANT OMISSION – FROM ALL THE REVIEWED DATA I CHOSE TO INCLUDE A LOG REPORT THAT'S ALL.....!!

IN MY OPINION THE GRAPH IN FIGURE 3.2 VALIDATES THE ERROR AND ADDITIONALLY DEMONSTRATES THAT THE VALVE WAS FULLY OPEN FROM THAT TIME UNTIL IDENTIFIED FROM THE LOG EXTRACT CONFIRMATION.

Figure 3.3 shows the site log for 26/4/10 but there is no copy of the site log for the original visit, this should also be included in the report.

ITE RESPONSE: IN MY OPINION IT ADDS NO VALUE – I'VE ADDED IT FOR THE 26TH APRIL TO DEMONSTRATE DIFFERENT DATA EXISTS.

It is also noted that the site log does not state that the valve is in the fully open position.

ITE RESPONSE: I'VE COVERED THIS EARLIER (DEFINED BY INTERVIEW).

2.0 TECHNICAL QUALIFICATIONS & RESPONSES

SMER report page 16 figures 5.1.3 and 5.1.4

British Gas Comment;

These indicate an event at around data point 12500 which affected the readings, if the scale was based on time rather than data points it would be easier to correlate the data to actual data.

ITE RESPONSE: I'VE ALREADY ANSWERED THIS COMMENT WITHIN THE LAST ITEM ON PAGE 3 OF MY INTERIM REPORT RESPONSES (A RESULT OF A SITE INTERVENTION VISIT IT WOULD SEEM...!!)

SMER report page 18 and 28

British Gas Comments;

Whilst the procedure for deriving the effect of the valve is good the results obtained are flawed, the reason could be the quality and suitability of the data obtained during these tests. The one parameter which is required to be stable is flow rate and this cannot be fixed by the site. Therefore it will vary during the tests giving inconsistent results. This is not unexpected with empirical results but it does increase their uncertainty.

ITE RESPONSE: I WOULD STRONGLY DISAGREE THAT THE RESULTS ARE FLAWED AND THE TEST GRAPHS DEMONSTRATE THIS (IT IS SUCH A SIMPLE "SWITCH ON – SWITH OFF SITE TEST") - I HAVE ANSWERED THE QUESTION WITH REGARD FLOW RATE STABILITY EARLIER.

The results should be shown for all of the tests so a judgement can be made as to the validity of the tests.

ITE RESPONSE: AS PREVIOUSLY STATED - IN MY OPINION, THE TEST RESULTS ARE SHOWN FOR ALL THE TESTS WITHIN THE DRAFT REPORT PAGES 19-27. A SAMPLE OF THE TEST RESULT SPREADSHEET IS ADDITIONALLY INCLUDED WITHIN REPORT APPENDIX B FOR THE TEST COMPLETED DURING 28TH SEPTEMBER.

SMER report pages 19 to 27

British Gas Comments;

It was noted that whilst it is claimed that the tests are representative of actual conditions, these tests only cover the lower half of the pressure range.

ITE RESPONSE: SORRY BUT THIS IS CLEARLY NOT TRUE – THE PRESSURE RANGE CREATED DURING TESTING WAS 50.7 – 64.3 BarG WHICH DEMONSTRATED IN MY OPINION BEYOND DOUBT, THAT THERE WAS NO CORRELATION IN ERROR DUE TO PRESSURE DIFFERENCES.

The test result tables do not show consistent behaviour for the change in flow rate to high, medium and low flow rates. It is expected that there would be a consistent pattern in these results in that respect.

2.0 TECHNICAL QUALIFICATIONs & RESPONSES

ITE RESPONSE: AS I'VE COVERED EARLIER - IN MY OPINION (AND THE TABULATED RESULTS & RESPONSE GRAPHS WITHIN THE REPORT DEMONSTRATE) – THE % ERROR versus FLOW RATE IS VERY MUCH CONSISTENT AND IS SHOWN TO BE SO WITHIN A RESULTS SPREAD OF 1% AT TEST FLOWS BETWEEN 72 & 160 Ksm³/h AND PRESSURES OF BETWEEN 50.7 & 64.3 BarG (+ AT 4 DIFFERENT TEST DATES.....!!

There is significant change in the error between 1 and 2 turns of the valve yet it is not clear that this may not apply in this case resulting in an error of 13% to 40%.

ITE RESPONSE: THIS IS NOT APPLICABLE TO THE SMER ERROR CONCLUSION AS THE EQUALISING VALVE WAS FOUND TO BE FULLY OPEN.

SMER report pages 28 section 7.2 and page 29 paragraph 1

British Gas Comment;

The derivation of flow rate may be flawed as it is based on average of the start and end flow rates, the information in Appendix B for a test from 28/9/10 shows that flow rates can increase before the end of a test period and change significantly during the period (pages B4 and B5). In addition the use of the final flow rate will increase the bias in the flow is increasing during the period. This approach can result in biased results and increased uncertainty.

ITE RESPONSE: AGAIN THIS HAS BEEN ANSWERED PREVIOUSLY - THIS IS WHY IN THE FINAL ERROR CALCULATION (AS I'M 100% CONFIDENT THAT THE EQUALISING VALVE WAS FULLY OPEN) I'VE ONLY USED THE "TEST END" FLOW RATE AS THE "FULLY OPEN" & "TEST END" FLOW VALUES WERE RECORDED WITHIN "MINUTES" OF EACH OTHER & THEREFORE NEGATES THE ISSUES WITH FLOW INSTABILITY.

SMER report page 29

British Gas Comment;

How was it demonstrated that the valve was fully opened? Is this by trying to fit the valve position to the error? Which is not applicable as the error is consistent after 2 turns of the valve.

ITE RESPONSE: AGAIN THIS HAS BEEN ANSWERED PREVIOUSLY (TOP OF PAGE 9).

SMER report page 31

British Gas Comment;

The correction should be based on actual flow rates, rather than a single value, the uncertainty on the corrections should be stated.

2.0 TECHNICAL QUALIFICATIONS & RESPONSES

ITE RESPONSE: THERE IS NO SIGNIFICANT CORRELATION THAT DEMONSTRATES THERE IS AN ERROR VALUE ASSOCIATED WITH A PARTICULAR FLOW RATE – THE SPREAD OF RESULTS ARE WITHIN 1% FOR ALL FLOW RATES & THE UNCERTAINTY IS THAT OF THE METER STREAM.

SMER report pages B2 to B7

British Gas Comments;

This indicates the instability in the flow rate and the dangers of using just the final flow rate.

ITE RESPONSE: AGAIN THIS HAS BEEN ANSWERED PREVIOUSLY (TOP OF PAGE 8).

It is noted that the standby DP shows a slightly different reading, so what evidence is there to justify using the high DP reading?

ITE RESPONSE: THE HIGH DP TRANSMITTER IS ALWAYS USED DURING NORMAL OPERATION AND THEREFORE TO REPLICATE THIS DURING TESTING, THE HIGH DP TRANSMITTER OUTPUT WAS USED.