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REVIEW OF PROPOSED AUGS FOR 2021_2022

Review of proposed AUGS for 2021_2022

ICoSS

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1 EXECUTIVE SUMMARY

DNV GL have been invited to review the first draft AUG Statement for 2021/22 on behalf of ICoSS and have identified a number of issues with the data and calculations. The key conclusions drawn are as follows:

- The consumption estimate used by the AUGE is approximately 50 TWh higher than expected. Consumption estimated using three different methods, all based on public domain data, was consistently below the AUGE's estimate. This difference has a knock-on effect and increases the UIG estimates in the following areas: theft, pressure, temperature, incorrect correction factors, and no meter read at line in the sand.
- There are issues with the consumption extrapolation to the forecast year for individual EUC/PC groups that result in unusual behaviour (e.g. sudden rises in population, aggregate AQ increasing then falling).
- The estimate of total theft is based on a percentage selected by the AUGE rather than being derived using a data driven calculation. It is based on data from other industries that the AUGE acknowledges are fundamentally different to the gas industry and includes a large degree of uncertainty. This approach does not constitute the "appropriate, detailed methodology" specified in the AUGE's terms of reference.
- Theft accounts for more than 75% of the UIG total, meaning the selection of this one number controls the majority of the overall UIG calculation. This undermines the integrity of the process because it is not data driven.
- The methods used by the AUGE to estimate total theft and theft split by EUC and Product Class have both been rejected by the industry in the past. The methods replacing them were both supported by the industry.
- The Unregistered Sites analysis over-estimates UIG from this source in a number of areas:
    - It assumes that all sites in the CDSP snapshots are flowing gas, when in fact they are just sites that are capable of flowing gas.
    - It does not correct large erroneous AQs.
    - It uses Requested AQs as an indicator of actual site consumption.
    - A large amount of UIG from a single mandatory DM site is carried forward to the forecast year, when it is unlikely that this site will remain Unregistered for this long.
- Sites that are Shipperless but awaiting their GSR visit have been omitted from the Shipperless analysis.
- The evaluation of CSEP Shrinkage is based on "a single value, based on anecdotal information", which is not a sound basis for such a calculation. Full details of the data and method used to arrive at this value should be published in the AUGS.
- The AUGE have identified new data sources for consumer meter error, which is a positive development.
- The analysis of no meter read at line in the sand is likely to over-estimate the number of such sites by not accounting for a peak of read submissions occurring close to line in the sand.

- The increase in pressure and temperature correction UIG is likely to be due to the use of different assumptions

Further details regarding each of these issues can be found in the sections below.

2 OVERARCHING METHODOLOGY

1. Our overarching methodology is detailed within Section 4 ("Overarching Methodology") of the draft AUG Statement. This methodology is based on the following principles:

1. *Polluter Pays – we interpreted "fair and equitable" to mean that UIG should be allocated in the same proportions as it is created;*
2. *Line in the Sand – we only considered UIG that will exist at the Line in the Sand (the final Settlement position) and not UIG that exists temporarily prior to this; and*
3. *Bottom-up Determination – we quantified UIG for each identified contributor and added these together, rather than estimating the overall UIG and apportioning it or using it as a means of differencing.*

Please highlight any aspect of this methodology with which you disagree and which you believe materially affects the Weighting Factors contained within the AUG Table, providing your rationale and, wherever possible, supporting evidence.

Response:

We are in agreement with the principles of "polluter pays" and the estimation of UIG as it exists at line in the sand. Bottom-up determination, whilst a reasonable aspiration, is not achievable in practice. This is due to the fact that no reliable evidence exists upon which to base a direct estimate of undetected theft. Both the previous and the current AUGE have identified this as the largest and most influential source of UIG, with its contribution to the total estimated at between 75% and 90%. It is therefore of the utmost importance to estimate it as accurately as possible. Whilst no reliable evidence exists to calculate it directly from the bottom up, all of the data necessary for an accurate top-down estimate is available – the only drawback to the top-down approach is that it is considerably more complex because it involves an analysis of every meter read from every site in the country. The importance of this element of UIG means that an accurate assessment of its magnitude is vital, however, and so there is a strong case to support the use of the exhaustive top-down method (which is fully documented in the AUGS for 2020/21) over a simplified bottom-up approach. This area is discussed in more detail in the Theft of Gas response below.

The overall UIG methodology is heavily dependent on the estimate of throughput. The vast majority of the UIG estimate is calculated by first creating a "percentage of throughput" estimate and then applying this to the throughput figures. This makes the accuracy of the throughput figures extremely important. Evidence suggests that the AUGE's throughput estimate is over-estimated in terms of its overall magnitude. In addition, there are inconsistencies in aggregate AQs and numbers of MPRNs for individual EUC/PC groups, both between historic snapshots and between the most recent snapshot contained in the AUGS (Sept 2020) and the forecast values for 2021/22. The latest snapshot of AQ data was not in the AUGS, which restricted the review of the forecast consumption results in the time available.

Details of our concerns are as follows:

- We have calculated total national throughput for the gas year to Sept 2020 by two different methods, using public domain data from the National Grid Data Item Explorer. These gave the following results:
    - A calculation based on aggregate DM and NDM energy values gave a total throughput of 526 TWh. *Note that this does not include UIG or LDZ Shrinkage.*
    - A calculation based on LDZ Demands (in mcm) and CVs gave a total throughput of 539 TWh. *Note that this includes UIG and LDZ Shrinkage.*
    - The difference between these two estimates is due to UIG and LDZ Shrinkage.

  The AUGE's estimate of throughput is calculated from aggregate AQs and thus does not include UIG or LDZ Shrinkage. It should therefore be comparable to the first (DM/NDM method) estimate. The AUGE's throughput estimate is 571 TWh, however, which is clearly around 50 TWh higher. This difference will have a material impact on all elements of the UIG calculation that are based on throughput.
- The Performance Assurance Committee (PAC) minutes from 12 January 2021 document the issue of AQ at risk. The minutes record that "The total AQ at risk as at 10 January 2021 was 54 tWh of AQ, a circa 10.6% of the LDZ portfolio, this was a reduction from 62 tWh in October". Using these figures from the CDSP suggests a total AQ for the 'LDZ portfolio' of 509 TWh, again significantly less than the current proposed throughput estimate of 571 TWh.
- The consistency of the aggregate AQ figures with estimates of throughput from different sources can be used as a simple validation procedure. In this case the aggregate AQs are clearly at variance with the throughput estimates, indicating a likely error.
- The AUGE stated in the AUG Sub-Committee meeting held on 15/01/2021 that they receive AQ data at the aggregate level only and do not remove or correct any AQs. We are aware from our experience and knowledge as the previous AUGE that the raw AQ data contains a considerable number of errors, including a number of extreme AQs that are inconsistent with the meter capacity of the site in question. Such errors need to be corrected before accurate throughput figures can be calculated, and they can only be identified when site by site data is used. We therefore recommend that the AUGE obtains site by site data, validates the AQ for each site, and corrects it where necessary. This is the only way of ensuring that the aggregate AQ figures are accurate.
- We believe, based on our experience, that errors in aggregate AQ could arise from one or more of the following sources:
    - Large erroneous AQs, as described above.
    - The inclusion of non-standard sites such as sites connected to LPG networks, which are outside the UIG process.

  The vast majority of any AQ error from these sources will go into EUC 09B. This could lead to a large over-estimate of the EUC 09B AQ, and hence a large over-estimate of the UIG assigned to this section of the market. The detailed split of AQ by EUC/PC provided in the AUGS shows that the aggregate AQ in the EUC 09B PC1 matrix position is approximately 50 TWh higher than that presented in previous AUG statements, showing that almost the entire difference comes from just this one matrix position.

- Forecasting consumption based on individual matrix positions may not be accurate. Some matrix positions have very low sample numbers, particularly following the split of EUCs 01B and 02B. There is also a dependency between some matrix positions which will not be accounted for by treating each separately e.g. mass movement of meters from PC4 to PC3. We suggest that the Exponential Triple Smoothing algorithm is applied at the aggregate level to confirm that the values obtained in this way are consistent with the values from summing individual matrix positions.
- The effect of Covid-19 on future consumption has been ignored. It is assumed that the 'new normal' will be no different to pre-Covid. There may, however, be a significant number of businesses which have closed or scaled back. Domestic consumption may also continue to be higher as a result of more home working even if workplaces do reopen. The AUGE should look to quantify this.
- The following are examples of anomalies that have been identified in the meter point count and AQ snapshot data in the AUGS. These raise concerns about the veracity of the underlying data.
    - Between 2019 and 2020, a large number of MPRs in 01B moved from PC4 to PC3 but the overall number remained fairly static. Between 2020 and the 2021 forecast, the number of MPRs in 01B PC3 increased significantly but this was not matched by a corresponding decrease in 01B PC4 meter numbers. The result is an overall increase in 01B meters by almost 0.5million. This seems unlikely. Similar anomalies exist in meter numbers in other EUCs (particularly 02B and 05B).
    - The AQ for EUC 02B changes from 22,508 GWh in 2019 to 47,346 GWh in 2020 but is then forecast to drop back down to 29,096 GWh in 2021. This suggests that there are anomalies in the AQ data that should be removed.
    - Between 2019 and 2020, the number of meters in EUC02NI/PC3 increases by about 10% but the AQ increases from 463 GWh to 6,316 GWh
    - For 2019, the AQ for EUC2PI PC3 is blank
    - For 10 matrix positions from EUC 04B upwards there are step changes in the AQ and number of sites between the last available historic snapshot and the forecast. Eight of these are upward changes and two are downward, resulting in an overall increase in AQ for the non-domestic sector (02B-09B) of 6% between Oct 2020 and the forecast period. Such an increase is unlikely given that the aggregate AQ of this sector remained very consistent for the previous four years. For comparison, the EUC 01B is forecast to have an AQ increase of just 1.8% during the same period. The tables below highlight this issue, with the step change matrix positions shown in red. The step change values for EUC 02B described above are also shown in red.
    - The AQ tables contain a number of zeros. As a non-consuming meter would have AQ=1 we would not expect this.

AQ Snapshot September 2019

Class	1	2	3	4
EUC Band				
01BND	-	0	2,130	277,106
01BPD	-	-	48	21,695
01BNI	0	0	288	10,833
01BPI	-	-	0	43
02BND	-	-	17	4,696
02BPD	-	-	0	211
02BNI	0	2	463	17,113
02BPI	-	-		6
03B	-	9	6,220	14,523
04B	3	31	4,972	18,089
05B	5	216	2,745	13,616
06B	78	1,681	1,390	12,076
07B	91	3,150	1,228	9,818
08B	2,368	9,055	1,326	10,779
09B	96,856	2,241	238	561
				548,016

AQ Snapshot September 2020

Class	1	2	3	4
EUC Band				
01BND	-	-	47,389	248,388
01BPD	-	-	424	20,211
01BNI	0	0	1,808	10,438
01BPI	-	-	1	42
02BND	-	-	249	4,626
02BPD	-	-	424	20,211
02BNI	0	2	6,316	15,510
02BPI	-	-	2	6
03B	1	8	5,348	14,434
04B	4	57	4,557	17,439
05B	30	245	2,289	12,580
06B	313	1,322	1,552	11,529
07B	657	2,553	1,447	9,611
08B	3,511	5,194	973	9,390
09B	91,109	880	263	1,725
				575,068

AQ Snapshot October 2020

Class	1	2	3	4
EUC Band				
01BND	0	-	46,952	247,151
01BPD	-	-	408	19,842
01BNI	0	0	1,789	10,413
01BPI	-	-	1	41
02BND	-	1	646	5,398
02BPD	-	-	3	168
02BNI	0	1	5,750	14,720
02BPI	-	0	49	56
03B	-	8	5,112	14,465
04B	3	56	4,373	17,302
05B	19	235	2,222	12,442
06B	307	1,327	1,494	11,471
07B	757	2,520	1,378	9,577
08B	3,645	4,985	974	9,403
09B	90,639	1,095	198	2,514
				551,910

AQ Forecast April 2022

Class	1	2	3	4
EUC Band				
01BND	-	0	50,901	246,446
01BPD	-	-	517	21,446
01BNI	0	0	2,905	10,174
01BPI	-	-	1	42
02BND	-	-	475	4,455
02BPD	-	-	3	129
02BNI	0	2	10,015	14,008
02BPI	-	-	3	6
03B	1	15	10,283	10,675
04B	0	75	9,382	14,294
05B	-	332	4,950	11,807
06B	50	2,465	2,374	10,880
07B	1,050	3,523	2,400	9,373
08B	2,649	8,530	1,081	14,827
09B	83,064	4,644	302	650
				571,204

Number of Sites September 2019

Class	1	2	3	4
EUC Band				
01BND	-	1	884,863	20,405,094
01BPD	-	-	16,374	2,339,399
01BNI	1	11	37,290	477,287
01BPI	-	-	7	3,987
02BND	-	-	2,352	42,310
02BPD	-	-	14	1,982
02BNI	1	9	39,767	122,769
02BPI	-	-	13	56
03B	-	17	14,045	32,301
04B	2	21	4,273	14,978
05B	1	51	826	3,992
06B	6	164	159	1,339
07B	5	150	61	485
08B	46	225	35	274
09B	348	15	3	9
				24,447,418

Number of Sites September 2020

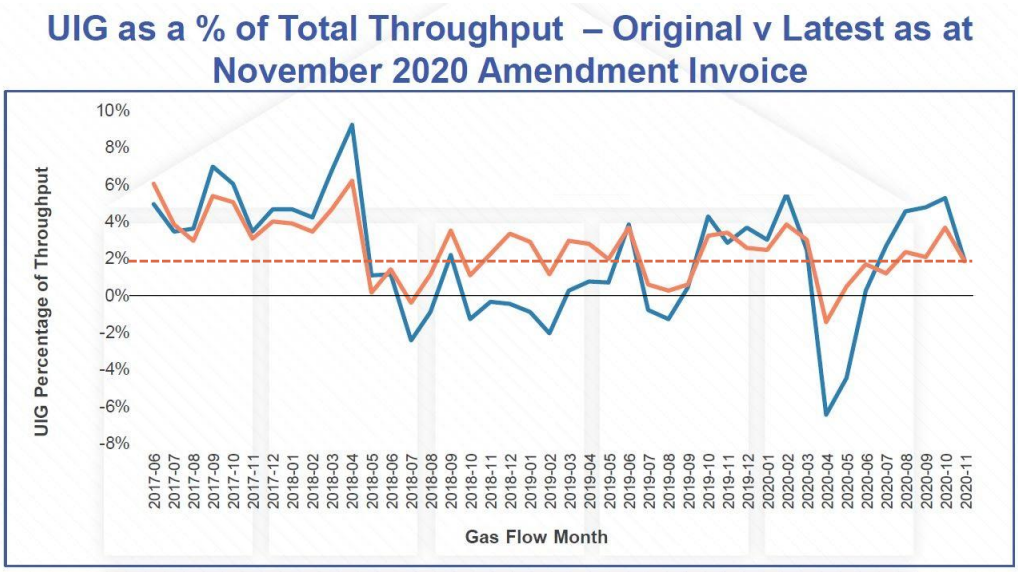
Class	1	2	3	4
EUC Band				
01BND	-	1	3,474,822	17,945,562
01BPD	-	-	46,277	2,098,800
01BNI	3	10	61,784	494,103
01BPI	-	-	27	3,640
02BND	-	-	2,830	42,023
02BPD	-	-	22	1,652
02BNI	1	5	42,785	111,399
02BPI	-	-	10	56
03B	1	24	14,315	31,880
04B	2	37	4,456	14,546
05B	7	46	764	3,696
06B	30	143	162	1,277
07B	33	115	68	471
08B	76	187	27	236
09B	338	15	2	24
				24,398,790

Number of Sites Forecast April 2022

Class	1	2	3	4
EUC Band				
01BND	-	2	3,954,387	17,835,324
01BPD	-	-	45,613	2,173,084
01BNI	4	12	99,211	493,409
01BPI	-	-	34	3,513
02BND	-	-	3,320	41,662
02BPD	-	-	26	1,613
02BNI	1	8	66,515	111,248
02BPI	-	-	22	52
03B	3	27	23,863	23,997
04B	1	45	7,817	11,544
05B	-	73	1,519	3,433
06B	20	257	266	1,183
07B	46	171	107	447
08B	72	212	26	360
09B	337	43	4	12
				24,904,945

These differences in the throughput figures have a knock-on effect on the validation of the calculated total UIG figure against observed post-rec UIG. As with individual UIG categories, the total UIG figure is calculated by first creating a percentage of throughput figure and then applying it to the throughput estimate. The error in the throughput estimate clearly therefore inflates the estimate of total post-rec UIG.

In addition, the figure for actual post-rec UIG as a percentage of throughput is inaccurate. This was calculated by the AUGE and quoted as 2.5%. The CDSP's figures for post-rec UIG are shown on the following graph. Whilst we do not have access to the data behind this chart, a basic analysis of plotting a midpoint value suggests a figure of approximately 1.8% for the period since UIG dropped from its early very high values.



This gives the following comparison between total post-rec UIG as calculated by the AUGE, and that calculated using the output from this analysis and throughput as previously calculated.

Using UIG=2.5% and throughput figures from the current draft AUGS for 2021/22

- Actual UIG = 14,109 GWh per annum
- Estimated UIG = 11,143 GWh per annum

Using estimated UIG=1.8%

- Actual UIG = 9,022 GWh per annum
- Estimated UIG from previous AUGS = 8,245 GWh per annum
    - Note that this estimated UIG is for the most recent training year

This is important because the figure of 14,109 GWh for total observed post-rec UIG is used as the justification for abandoning the Consumption Method (from the previous AUG statements) for estimating total UIG, on the grounds that its estimate was too low. These figures suggest the opposite.

In summary, we recommend the following:

- The AUGE should check and confirm that their AQ data contains only sites which form part of the LDZ demand.
- The AUGE should obtain site-by-site AQ and meter capacity information, identify sites with erroneous large AQs, and update the aggregate throughput figures accordingly.
- The AUGE should check the site-by-site AQ data for sites having multiple AQ records. For example, our previous experience has shown that some meters may appear in multiple LDZs.
- The AUGE should investigate the anomalies identified in the snapshot data and forecast provided in the AUGS.
- The AUGE should calculate total UIG for future years using the Consumption Method, or a similar difference-based approach. It is recognised that this will not be possible in the time available for the AUGS for 2021/22. Therefore, in this case, an approximation should be used, or the figures from the previous AUG Statement carried forward as a best estimate.
- The AUGE should investigate the likely impacts of Covid-19 on future consumption.

3 CONTRIBUTORS UNDER DETAILED INVESTIGATION

2. Our results for the four contributors under detailed investigation are contained within Section 5 ("Detailed Investigations") of the draft AUG Statement. For each of these contributors, please highlight any assumptions, methodology aspects, calculations and results with which you disagree and which you believe materially affect the Weighting Factors contained within the AUG Table, providing your rationale and, wherever possible, supporting evidence:

2.1 010 - Theft of Gas;

2.2 040 - Consumption Meter Errors;

2.3 050 - LDZ Meter Errors; and

2.4 090 - No Read at the Line in the Sand.

3.1 010 - Theft of Gas

The AUGE's new method for calculating total theft is to estimate a figure for the total theft percentage from figures quoted for three other industries: electricity, water and retail. This replaces the previous method where total UIG was calculated using the Consumption Method, and the element relating to undetected theft was calculated by removing directly calculated UIG that arose from other sources.

Undetected theft is similar in nature for any industry, in that there is no data available to calculate it directly using a bottom-up approach. Therefore, estimates for any industry are likely to be unreliable and based on very limited evidence, and it is unclear why it should be considered valid to calculate a figure for the gas industry based on unreliable data from other unrelated industries.

In addition, in Section 5 of the AUGS, the AUGE acknowledges that none of the other industries considered is representative of the gas industry, and that each has fundamental differences from it. Despite having drawn these conclusions, the method of choosing a gas theft percentage figure as one somewhere in the middle of very loosely estimated ranges for other unrepresentative industries is still used. Concluding that each industry for which data has been retrieved is fundamentally different to gas, but then going on to use figures from them to draw conclusions about gas, is illogical.

The principle of attempting to arrive at a figure for theft as a proportion of throughput and calculating total theft based on this figure was introduced in Mod 228 (2009). Even 11 years ago, and before there was an AUGE, this approach was rejected both by the industry, and, importantly, by Ofgem. The industry voted heavily against this modification during consultation, and Ofgem rejected it, specifically noting:

"… we do not consider that these proposals provide an explicit and traceable methodology for distributing Unidentified Gas."

and

"Given the uncertainties associated with the measurement of Unidentified Gas itself, we consider it would be imprudent to implement such a proposal even in the short term." [Mod 228 Decision, 26 May 2010]

Both of these comments refer to Mod 228/228A together. The method of calculating theft as a proportion of throughput and applying this to the throughput estimate is an integral part of Mod 228.

By contrast, the use of the Consumption Method to estimate total UIG, and from this the total for undetected theft, was strongly supported by the industry. This can be seen in the AUG process consultation responses from 2012, when the method was first introduced.

In addition to the above, the ranges of gas theft quoted for electricity, water and retail are wide and create a great deal of uncertainty in the estimation of theft. The ranges quoted in the AUGS are:

Electricity: 1.0% to 2.5%

Water: 1.0% to 3.0%

Retail: 0.5% to 3.0%

It should be noted that in their presentation to the AUG Sub-Committee on 15/01/2021, the AUGE stated that the range for retail is 1.1% to 1.62%. This is an error in the presentation: 1.1% is the best estimate of organised crime theft from retail, whilst 1.62% is the point best estimate of retail theft, not an upper limit.

It is also important to note that the AUGS only includes references to source material for statistics about retail theft. There are no references for electricity or water theft. This creates a lack of transparency regarding where these figures come from, and the AUGE should provide references in the next draft of the AUGS so that the source data can be scrutinised.

In terms of electricity theft, the AUGE recognises that theft related to cannabis farms is not relevant to gas theft but no mention is made of the size of this effect. A Mail Online report on Ofgem proposals from 2014 states that *"Ofgem officials say the industry detects up to 25,000 cases of electricity theft each year, and estimates that up to one third of the volume of electricity stolen each year is used to power cannabis farms."* [7]. Reducing the electricity theft by this amount results in a theft range of 0.67% to 1.7%.

The main reference source for retail theft used by the AUGE appears to be the Retail Crime Costs in the UK Report. Although this quotes a figure of 1.42%, it recognises that ~25% of this is due to administrative errors rather than actual theft. A further 18% of theft is attributed to warehouse theft. In fact, only 34.6% of the total 1.42% is acknowledged as consumer theft (shoplifting).

In the gas industry, theft is split between consumer theft (downstream of the ECV) and upstream theft, which forms part of shrinkage and is very small (0.02%). The methodology proposed by the AUGE is based on estimating total theft from other industries and assuming a similar level of overall theft in gas. They then remove the upstream gas theft from this estimate. This approach assumes that the overall level of theft is comparable. This seems an unreasonable assumption given that upstream theft is far more prevalent in the retail sector. The Retail Crime Costs in the UK Report talks about theft from consignments, delivery vehicles and warehouses. Warehouse theft alone is 18% of total theft which is considerably higher than the levels of upstream theft in the gas industry. We believe that a more reasonable assumption would be that consumer theft is similar between industries.

The AUGS states that Retail Crime Costs in the UK – Centre for Retail Research estimated organised crime as 21.97% of all theft across the retail sector and employee related crime as 22.10%.". This report actually estimates organised crime as £562m out of a total crime figure of £4,821m. This is only 11.7%.

Based on the above figures, the conclusion that gas theft is likely to lie in the range 1.25% to 1.75% is flawed, particularly when the ranges for each individual industry are far wider than this. The choice of 1.5% as the best estimate for gas theft is just the midpoint of the arbitrarily chosen range.

The AUGE Framework Document states the following:
"The AUG Expert will create the AUG Statement and AUG Table by developing appropriate, detailed methodologies and collecting necessary data."

The selection of an estimate of 1.5% based on the information presented in the AUG Statement and the AUGE's "balanced judgement" does not constitute an appropriate, detailed methodology and hence does not comply with the AUGE's terms of reference.

As stated above, it has been shown that undetected theft accounts for between 75% and 90% of the UIG total, and as such the basis for its calculation is the single most important element of the entire analysis. The AUGS states that the figure of 1.5% is based on a "balanced judgement" with no further explanation – this is not an appropriate method of arriving at the most important figure in the whole UIG calculation.

Whilst, for the reasons given above, we therefore regard the whole approach to calculating theft as being unreliable, we are particularly concerned at the manner in which the theft percentage of 1.5% (or 1.48% once a figure for theft in conveyance has been taken off) has been derived. The industry should be given

detailed data and the full analysis that gave 1.5% as its output in order to have full transparency regarding where this figure came from.

The level of uncertainty caused by the wide ranges of likely theft levels in other industries is shown in the table below. This table shows theft, calculated using the AUGE's method and throughput estimate, based on the low and high limits and the midpoint.

		Low	High	Average
Electricity	Percentage	1.0%	2.5%	1.8%
	Theft Total (GWh)	5,712	14,280	9,996
Water	Percentage	1.0%	3.0%	2.0%
	Theft Total (GWh)	5,712	17,136	11,424
Retail	Percentage	0.5%	3.0%	1.8%
	Theft Total (GWh)	2,856	17,136	9,996
"Balanced Judgement"	Percentage	1.25%	1.75%	1.50%
	Theft Total (GWh)	7,140	9,996	8,568

This table shows that, depending on the limits used, theft **could** lie anywhere between 2.9 TWh and 17.1 TWh. This range (14.2 TWh) is larger than the entire best estimate of UIG (11.1 TWh), illustrating the extent to which the selection of the theft estimate percentage controls the entire UIG total.

It is vital that the theft percentage is therefore calculated in a robust and repeatable manner, using representative and accurate input data. This is not the case, however: as stated in the AUGS, the figure was chosen from a list of wide theft ranges for other industries that are fundamentally different from gas, and the estimate of 1.5% was selected by the AUGE using their "balanced judgement". This approach (and hence the UIG total) is therefore no longer data driven, and the output is not the result of the analysis of relevant data from the gas industry – it can be directly controlled by the AUGE through their selection of the theft percentage and their balanced judgement.

There are two key elements to the calculation of theft, which as described is by far the biggest contributor to overall UIG. The first is the calculation of the overall theft figure, which is discussed above. The second is the split of that figure between market sectors. In line with the principle of polluter pays, it is vital that theft is assigned to the market sectors where it actually happened, and in particular that undetected theft is assigned to the market sectors where the gas is being stolen.

It is recognised throughout the gas industry that the split of detected theft by market sector is not representative of the split of undetected theft by market sector. This is due to the simple rule that you only find gas theft where you look for it, and different Shippers and Suppliers, who work in different sectors, have very different theft detection strategies. The result of this is that detected theft is strongly skewed towards those market sectors where the most theft detection activity is carried out.

It is also accepted throughout the industry that the split of theft between market sectors is not proportional to throughput, i.e. different sectors of the gas market have different propensities to theft.

This is illustrated in the AUGS consultation responses from the industry for the 2017/18 and 2018/19 statements. At this time, TRAS either did not yet exist or had too little data for a reliable analysis, and as such, in the absence of this data, theft was split between EUC and Product Class by throughput. All sides of the industry urged change as soon as possible, and the Theft Method was introduced for the 2019/20 AUGS in response to this. This change was firmly supported by the industry (AUG Statement for 2019/20, Section 5.1).

The new method for splitting theft between market sectors, detailed in the AUGS for 2021/22, uses the following principles:

- Standard theft is split between Smart and traditional meters using **detected theft** as a basis
- Smart Meter standard theft is split by EUC/PC groups using **throughput**
- Traditional meter standard theft is split by EUC/PC groups using **detected theft**
- Advanced theft is split by EUC/PC groups using **throughput**
- It should be noted that no distinction is made between sites with AMR and those with a traditional meter, therefore creating an inherent assumption that the theft rate from these two types of site is the same. Given the difference in data and the fact that AMR sites are often large (and so theft from them will have a larger economic impact on the Supplier), we believe this assumption is likely to be incorrect. The theft split calculation should be updated to recognise AMR sites as a separate population
- The draft AUGS makes no mention of telemetered sites and how these are treated in terms of theft. Given that these sites will have very large consumptions and are continually monitored, we would expect the chances of undetected theft occurring at these sites to be very low.

Based on the above, it can be seen that all theft is split between market sectors using a combination of detected theft and throughput. Both of these methods were rejected by the industry from 2016 onwards, when data started to become available in TRAS to calculate the market sector split more accurately. Once this data became available, its use as a basis for splitting theft between market sectors (including the removal of the inherent bias within it) was firmly supported across the industry.

The issue of theft has been debated at length over many years and it would be worth the AUGE reviewing previous proposals, meeting minutes, modifications and methodologies to ensure that the proposed solution going forward isn't one that has already been rejected by the industry.

In addition to these concerns, we would like to draw attention to the following three statements regarding theft that appear in the AUGS:

AUGS p29
"We believe that it is reasonable to assume that the levels of advanced and very difficult to detect theft that exist across the gas sector are equivalent to at least half of the organised crime theft percentage above."
This is quoted without evidence. Both the data and the analysis of it that led to this conclusion should be published for industry scrutiny.

AUGS p33, Assumptions
"Detected theft trends are a reasonable indicator of typical undetected theft"
As stated above, this assumption was rejected by all sides of the industry in 2016.

AUGS p34, Calculation
"6. Remove all records of fiscal theft."
There are repeated references to removing fiscal theft records but no explanation of how this is done in the absence of a fiscal theft tamper code. The method for identifying and removing fiscal theft records should be published in full.

Finally, the following reasons were given for abandoning the Consumption Method:

- *"The current residual UIG for Gas Days almost fully reconciled would suggest that previous estimates of the total UIG were significantly too low."*
  This conclusion has been shown to be erroneous, and it is based on inaccurate input data.
- *"In addition, the quantification of non-theft UIG has varied considerably year to year. It is for these reasons that we chose not to follow the differencing methodology for theft."*
  The year-to-year variation in the Balancing Factor is due to the artificial assignment of UIG to specific historic years. This was done because the UIG factor calculation is an annual process and is for presentation purposes only. Meter reads do not align with gas year changes, and hence the assignment of consumption to fixed gas years introduces error, which manifests as the year-to-year variation in Balancing Factor. UIG is in reality a continuous process, and when considered this way (as used in calculations) this issue does not exist. In addition, it should be noted that non-theft UIG does change year on year in response to different drivers within the industry: these include Mods introduced to address UIG, Product Class migration, the Smart Meter roll-out and so on. It is quite reasonable for the non-theft element of UIG to vary in response to such drivers.

Based on the above analysis, the new approach to the theft calculation is not data driven and introduces a huge amount of uncertainty into the UIG estimate.

Overall, the following conclusions are drawn regarding theft:

- Both the gas industry and Ofgem rejected the Mod that included the proposed method for estimating total theft in 2010.
- The proposed method of splitting theft by market sector using throughput and detected theft as a basis was rejected by the industry in 2016.
- The AUGE should re-consider the calculation of total UIG for future years using the Consumption Method or a similar difference-based approach, and split theft between market sectors using bias-adjusted TRAS data. It is recognised that this will not be possible in the time available for the AUGS for 2021/22. Therefore, an approximation should be considered, or figures from the previous AUG Statement brought forward as the best estimate.

3.2 040 - Consumption Meter Errors

The use of In-Service Test data from OPSS is a positive step and this should continue for future years.

3.3 050 - LDZ Meter Errors

We agree that there is unlikely to be a significant amount of permanent UIG from this source. as errors are quickly identified and corrected for prior to line in the sand.

3.4 090 - No Read at the Line in the Sand

The calculation process for this element of UIG is based on statistics for the number of sites with no submitted meter read at two specific points in time. The start point used is April 2018, and the number of unread meters is assessed at:

- 27 months (to June 2020)
- 30 months

From these, a rate of reconciliation is calculated, and this is extrapolated through to line in the sand. This analysis results in a large number of sites being identified as having no meter read at line in the sand, and hence potentially producing UIG (dependent on their allocated demand).

This approach is flawed in that it is based on a short period of time where the reconciliation rate will be relatively low. A number of industry parties have stated their belief that there is a peak in meter read submission as line in the sand approaches, which would mean that the proposed method over-estimates the number and AQ of sites that reach line in the sand with no read.

There has been insufficient time during the consultation period for us to obtain data to verify this assertion. We believe that this data can be made available to the AUGE, however, and therefore it should be analysed to ascertain whether such an effect exists. If it does, the effect should be quantified and included in the methodology for this element of UIG in the next draft of the AUG Statement.

It was noted in the AUG Sub-Committee meeting held on 15/01/2021 that there are currently 273,000 meters with no read since Nexus go-live in June 2017. This is considerably fewer than the ≈500,000 meters with no read after 27 months shown in the AUGS, illustrating the point that reconciliation is ongoing and reducing the number of meters with no read. It should also be noted, however, that line in the sand has not yet been reached for these 273,000 meters, and nor has the likely time of the pre-line in the sand peak. This is therefore not an indication of how many meters will still be unread at line in the sand.

The accuracy of this data also needs to be established. One Shipper carried out an investigation of a particularly large site that was listed as having no meter read since Nexus go-live: this revealed that the site hadn't gone live until late 2020 and was submitting reads less than 2 months later. Whilst this is only a single example, it is also the only site on the list known to have been investigated in detail, and its inclusion was shown to be erroneous. Therefore, the data set used for the No Meter Read at Line in the Sand analysis should be thoroughly analysed to verify that it is of sufficient quality for use in the UIG calculations.

4 CONTRIBUTORS NOT UNDER DETAILED INVESTIGATION

"3. Our results for the six contributors not under detailed investigation are contained within Section 6 ("Other Contributors") of the draft AUG Statement. For each of these contributors, please highlight any assumptions, methodology aspects, calculations and results with which you disagree and which you believe materially affect the Weighting Factors contained within the AUG Table, providing your rationale and, wherever possible, supporting evidence:

3.1 070 - Average Pressure Assumption;

3.2 080 - Average Temperature Assumption;

3.3 100 - Incorrect Correction Factors;

3.4 020 - Unregistered Sites;

3.5 025 - Shipperless Sites; and

3.6 060 - IGT Shrinkage."

4.1 070 - Average Pressure Assumption

The approach described within the draft AUGS appears to be an appropriate methodology, although the amount of UIG estimated is higher than we would expect (see "080 – Average Temperature Assumption" below for a comparison of total volume conversion error, i.e. pressure and temperature, with estimates from Dave Lander Consulting). The proposed approach is at a more granular level than was used for previous AUG analyses (by LDZ and matrix position), which is considered an enhancement subject to data quality at this level.

There are a number of areas where simplifying assumptions have been made as described below.

The pressure error rate is assumed to be constant (0.00098692m^3/mbar). This will actually vary with pressure. We would expect to see the derivation of the pressure error rate in the AUGS and the justification for assuming it is constant. The AUGS states that the Pressure Volume Error Rate is calculated "from the Ideal Gas Law and the linear relationship between pressure and volume". But, according to Boyle's law, there is an inverse (non-linear) relationship between pressure and volume.

The approach adopted by the AUGS takes no account of different regulator set pressures. Any change in atmospheric pressure or altitude will have less of an effect for meters operating at higher set pressures.

It should be noted that as this component of UIG is calculated as a proportion of the consumption which is subject to volume conversion errors, the use of higher estimates of consumption and different assumptions regarding the amount of consumption from sites which do not contribute to volume conversion UIG will impact the UIG estimate. The UIG estimates for 2020/21 were based on ~19% [1] of consumption being from meters which were not subject to volume conversion errors. An equivalent figure is not provided in the draft AUGS for comparison.

The draft AUGS suggests that the increase in the estimate of pressure related UIG is partly the result of the average altitude assumption, however a separate estimate of the UIG resulting from the altitude is not provided. Previous studies [1][2] have concluded that although altitude causes a geographic variation in UIG, the overall impact at GB level is not significant.

The altitude-related UIG calculated by the AUGE appears to be based on the difference in altitude between each postcode and 66m. Although 66m is often quoted as the average GB meter altitude, it is actually the average altitude of the weather stations used [3]. The Thermal Regulations [4] provides a table of values of pressure corrections based on altitude for 2.5m altitude intervals. 66m falls in the interval 65-67.5m so the value of 8.114 is used as a pressure correction. For whatever reason, the table in the Thermal Regulations is based on the upper value for each interval. The value of 8.114 used to calculate the standard correction factor is therefore actually the value which corresponds to 67.5m. The values in the table within the Thermal Regulations can be calculated from the linear relationship Pcorrection = 0.120208 x Altitude. Calculating the average altitude (weighted by postcode code) provided in the AUGS results in an average altitude of 67.68m.

We recommend that the AUGE recalculate the altitude related UIG based on an average altitude of 67.5m and a pressure reduction of 0.120208mbar/m altitude gain.

4.2 080 - Average Temperature Assumption

The methodology described in the AUGS appears to be suitable. Performing the calculation at a more granular level represents an enhancement subject to data quality at this level. However, as for pressure related UIG, the estimate of total UIG from this source is larger than we would expect. The fact that both pressure and temperature are affected suggests that a significant part of the increase lies in the increase in forecast consumption and possibly in the assumption about how much gas is consumed through meters subject to volume conversion errors. The draft AUGS provides no information on the amount of gas from telemetered sites (which provide energy values directly to the CDSP) and sites with volume conversion devices. Neither does the draft AUGS provide any detail regarding the numbers of internal and external meters.

Although the calculations are consistent with those used previously, there are a number of different assumptions (in addition to those relating to consumption described above) as follows:

- Previously, the temperature used for the gas was based purely on EUC. This approach was taken as the location of the meter (and therefore the assumed temperature) is unlikely to change as a result of a Product Class change. The draft AUGS allows for different temperatures by EUC and Product Class.
- Meters in unheated spaces such as garages and porches were previously treated as internal meters but these are now being treated as external meters. In reality, the temperature will lie somewhere in between. The Domestic Meter Temperature Survey (DMTS) [5][6] noted that gas in these meters was on average 2.6C warmer than in external meters, which is approximately halfway between internal and external temperatures. An adjustment for this could be included in the methodology.
- Different temperature assumptions are used by matrix position, in part as a result of the more granular approach taken by the AUGE.

Given that the estimate of temperature related UIG is significantly higher than previous estimates, we have provided a comparison with results from work carried out by Dave Lander Consulting for Ofgem [2]. This work looked at the combined effect of volume conversion error (pressure and temperature effects together) for domestic meters. Although the work was aimed at domestic meters, the study assumed all meters were externally located and so represents an upper estimate of the volume conversion error.

This study concluded that metered volumes were being under-recorded by 0.238% due to volume conversion. This error rate can be extrapolated to the full population of meters to get an estimate of total UIG from volume conversion. Taking the forecast consumption of 571,208 GWh from the draft AUGS and assuming that 19% of this comes from meters not affected by volume conversion gives a consumption of 462,678 GWh which is affected by volume conversion errors. Applying the volume conversion error rate of 0.238% to this provides an estimate of 1,101 GWh of UIG. This is much lower than the estimate provided in the draft AUGS of 1,570 GWh (1,263 GWh from temperature + 307 GWh from pressure). We would also expect the actual UIG to be significantly less than this once the effect of internal meters is accounted for.

Although the proportions of meters (by AQ) were not included in the draft AUGS, we have subsequently been provided with this data. This clearly shows an anomaly in EUC09 PC1 where the proportion of volume converters is only 76.35%. We would expect this to be close to, if not 100%. EUC09 PC2 and PC3 are both 100% and EUC08 PC1 is 97.99%. This anomaly will significantly increase the total UIG

from volume conversion (temperature and pressure) and in particular will affect EUC09 PC1. We believe that any sites in EUC09 PC1 which are not flagged as having volume converters should be queried with the CDSP. One explanation is that these sites may be telemetered. These are generally very large sites which actually have equipment to convert the reads into energy and send this directly to the CDSP. These sites should be treated in the same way as sites with volume converters as the energy conversion uses locally measured temperature and pressure.

4.3 100 - Incorrect Correction Factors

The methodology described in the draft AUGS appears to be suitable. The increase in UIG from previous estimates is likely due to an increase in the estimated consumption and any differences in the proportion of the consumption which is subject to volume conversion errors.

4.4 020 - Unregistered Sites

The proposed method is very similar to the one used in previous years, but carried out at the national rather than LDZ level. The following areas are missed from the analysis, however, leading to an over-estimate in the total UIG from this source and inaccuracy in the assignment to EUC/PC groups.

- The analysis treats each site in the Unregistered Reports as though they were **actually** flowing gas. The report contains sites that are **capable** of flowing gas – only a small percentage are actually doing so. This leads to an over-estimation of UIG from this source.
- No erroneous AQs are corrected. Experience from previous years shows that the data contains a number of extreme erroneous AQs. The AUGE presentation from 11/11/2020 specifically says that no AQs are amended, and this was confirmed at the AUG Sub-Committee meeting on 15/01/2021.
- UIG is split by EUC/PC groups with no consideration of PC2 consisting of a mix of ex-DM sites (which do not consume UIG) and ex-NDM sites (which do). This will lead to an over-allocation of UIG to PC2.
- Unadjusted AQ figures from the CDSP Unregistered Report are used in calculations. These are Requested AQs, which analysis shows to be consistently higher than the actual quantity of gas that the site will use. Therefore, these figures need to be adjusted to accurately reflect UIG from this source.

In addition to the above, the majority of the UIG from this source (68 GWh out of a total of 101 GWh) comes from a single mandatory DM site in EUC 09B PC1. This is therefore a very large site and it is consuming more Unregistered UIG than is normally seen across the entire population. This is an unusual circumstance, and as such the site for back-billing. This does not necessarily make it valid to forecast that this amount of UIG will continue to be consumed in the forecast year, however.

A site of this magnitude being Unregistered and consuming gas that cannot be backbilled is very unusual, and in our opinion the level of scrutiny that has now been placed upon it means that it is unlikely to continue – the forecast figures carry an inherent assumption that this site (or a similar site) will remain Unregistered right up to the end of the forecast year, which is over 18 months away. This situation is, in our opinion, extremely unlikely, and unique occurrences like this one should not be part of the forecasting process.

The following conclusions are drawn:

- The AUGE should correct each of the four issues identified above and include these corrected calculations in the next draft of the AUG Statement.
- The forecast to the 2021/22 gas year should not include the mandatory DM site that is currently Unregistered, as it is extremely unlikely that it will remain Unregistered for this length of time.

4.5 025 - Shipperless Sites

The proposed method is very similar to the one used in previous years, but is carried out at the national rather than LDZ level. One source of UIG in this category is missing from the analysis and should be included in revised calculations in the next draft of the AUG Statement.

The analysis is based entirely on data from the Shipperless Report. This contains sites that have had their GSR visit and have been confirmed to be capable of flowing gas. It omits all of the sites that have been Shipperless for less than 12 months and are awaiting their GSR visit – some of which will be consuming UIG. Given that the AUGE calculations use a fully bottom-up approach, this element of UIG is not accounted for anywhere else and is lost.

4.6 060 - IGT Shrinkage

For this category of UIG, a similar method to the previous one is proposed. It has been modified to link UIG from this source to total CSEP population rather than the annual estimate of Shrinkage calculated by the networks using the Shrinkage and Leakage Model. This is a positive development.

The AUGE were unable, however, to obtain figures for total mains length in CSEPs from the IGTs. They were also unable to obtain a figure for mains length per MPRN in CSEPs from the network models (the approach used by DNV GL in previous years).

The AUGE chose a different approach. The method used was stated as:
"We used a single value, based on anecdotal information" [AUG Statement for 2021/22 p112]

There is no explanation of what the value is or what anecdotal information was used to set it. The AUGE has a responsibility to make all of their calculations data driven and evidence based, and anecdotal information is therefore not a suitable basis for such an analysis. The necessary data should be obtained to carry out a robust calculation in this area. In the meantime, as a minimum the data used to derive their "mains length per MPRN" figure, the logic applied to it, and the figure itself should all be published to allow the industry to scrutinise this area properly. One alternative approach that could be considered is to use the mains length per MPRN figure of 8.6m from the last AUG Statement until such time as better data (e.g. from the iGTs) can be obtained.

Finally, it was confirmed during the AUG Sub-Committee meeting on 15/01/2021 that the UIG total from this source was split between market sectors using total national throughput (i.e. CSEP plus non-CSEPs). The composition of CSEPs by market sector is different to the overall population, and this needs to be reflected in the calculation: splitting CSEP Shrinkage by national throughput results in an over-allocation of UIG from this source to high EUC bands. The total CSEP Shrinkage figure should be split between market sectors using CSEP throughput only. This correction should be made and included in the next draft of the AUG Statement for 2021/22.

5 OTHER MATTERS

"4. If there is any other relevant matter in relation to this consultation that you would like to raise which you believe materially affects the Weighting Factors contained within the AUG Table, please explain this and provide your rationale and, wherever possible, supporting evidence"

We are concerned that at the AUG Sub-Committee meeting of 15/01/2021 there were several requests from the industry for more data and calculation details to be supplied regarding certain elements of the AUGE calculation, and in a number of cases the AUGE responded that they did not believe they could supply this. In the past, all data and calculations requested by the industry were provided on UK Link Secure Docs. It is important for the industry to be able to scrutinise the UIG calculations, and it would appear to be a backward step in terms of the transparency of the AUG process for this to no longer be possible for all areas of the analysis.

6 REFERENCES

/1/ Final Allocation of Unidentified Gas Statement for 2020/21, DNV GL, 18 March 2020

/2/ Gas Energy Measurement in Consumer Billing, D.F. Lander, 23 July 2014

/3/ Gas energy measurement, A consultation document, Ofgem, November 2000

/4/ The Gas (Calculation of Thermal Energy) Regulations 1996

/5/ Domestic Meter Temperature Monitoring Exercise analysis of returned data, M. C. Gaskell, BG Technology, June 1999

/6/ Summary Report of the Domestic Gas Temperature Survey (2000), M.C. Gaskell; M.R. Ranzetta, BG Technology, August 2000

/7/ Revealed: How middle-class families are turning to crime by getting specialist gangs to 'hotwire' their gas and electricity supplies to beat soaring energy bills, Daily Mail, 20/01/2014 https://www.dailymail.co.uk/news/article-2542487/Energy-theft.html

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