Background

The potential impacts of the use of a single national Conversion Factor on the accuracy of daily gas allocations and therefore on Unidentified Gas (UIG) were highlighted by Xoserve's UIG Task Force in 2019. The estimated impact on UIG and a number of possible solutions/mitigations were presented at a meeting of the UNC UIG Workgroup in January 2019. There was no obvious single solution to the issue and no clear consensus on preferred option(s) to take forwards.

Subsequently Scottish Power raised a UNC Review Proposal (0693 - Treatment of kWh error arising from statutory volume-energy conversion) to review the options and identify a preferred solution (or combination of solutions).

Problem Statement

All sites with an Annual Quantity (AQ) under 732,000 kWh should use the single industry standard conversion factor which is specified in legislation (also referred to as a Correction Factor). The standard factor of 1.02264 accounts for an assumed average temperature and altitude. However individual sites will have different altitudes above sea level and different temperatures at their meter.

Warmer gas will have a greater metered volume than cooler gas, so the same energy quantity will take on a larger volume under warmer conditions at the meter. This is because gases expand when they are warmer. Because gas is metered in volume then converted to energy using the standard conversion factor, this will cause fluctuations in the amount of gas measured. Gas at a higher altitude will have a greater metered volume than gas at a low altitude, because the atmospheric pressure will be lower and the gas will have more freedom to expand. The Allocation of Unidentified Gas Expert (the AUGE) assesses the impact of altitude to be negligible compared to temperature.

The use of a standard conversion factor will tend to cause energy to be under-measured in cooler or low-lying locations (or under cooler weather), and over-measured in warmer or more elevated locations (or under warmer weather). There will be an equal and opposite effect on Unidentified Gas.

Larger sites (with an AQ of over 732,000 kWh) should have a site-specific conversion factor, which is usually determined by the Meter Asset Manager. That conversion factor is a static value, based on average conditions: if the ambient temperature at the meter varies, perhaps with the seasons, then gas will be over- or under-measured across the year.

The UIG Task Force assessed the average impact to be 0.45% additional UIG, with a peak impact of up to 5%, although this varies across LDZs and depending on the weather,

For further details and links to additional resources please see the recap presentation given at the February meeting of the Workgroup:

https://www.gasgovernance.co.uk/sites/default/files/ggf/book/2020-02/2.0%20Recap%20on%20UIG%20Task%20Force%20Issue%2012.2%20-%20Standard%20Conversion%20Factor.pdf

Purpose of this document

This document supports the ongoing discussions at UNC Review Group 0693 (Treatment of kWh error arising from statutory volume-energy conversion) and analyses the five leading options in more detail, against a number of key aspects.

The latest full list of options was reviewed at the July Workgroup meeting:

https://www.gasgovernance.co.uk/sites/default/files/ggf/book/2020-07/RG0693%20Options%20Analysis%20v3.xlsx

The options analysed here are:

4 (ii)	Add a new LDZ level factor to the volume-to-energy conversion formula to account for the net difference in energy. The factor would be calculated daily using actual LDZ weather
5	Amend the AUGE process to re-distribute UIG based on estimated impacts of conversion factors (forecast basis) ***– Already Implemented for Gas Year 20/21***
7	Introduce an LDZ level conversion factor (permanent/per year/per month)
10	Adjust LDZ daily gas inputs to use standard correction
11	Adjust daily gas allocations and subsequent meter point reconciliations to take account of impact of actual weather on metered gas volumes.

Proposed Success Criteria

The October 2020 meeting reviewed Version 1 of this document and proposed the following success criteria to apply when selecting an option (or options):

- Addresses all three phases of settlement
- Benefit is permanent rather than temporary *(i.e. not undone by meter point reconciliation)*
- Lead times for implementation, shorter being better
- Compliance with the Thermal Energy Regs being highly desirable

Version History

1.0	Prepared originally for October 2020 Workgroup Meeting, based on earlier Options Spreadsheets
1.1	Update for November 2020 Workgroup Meeting, addition of Proposed Success Criteria against which to judge options, plus minor amendments
1.2	Updated for December 2020 Workgroup Meeting, including responses to feedback from National Grid NTS on Version 1.0 *– highlighted in blue*

OPTION	**4 (ii) Add a new LDZ level factor to the volume-to-energy conversion formula to account for the net difference in energy. The factor would be calculated daily using actual LDZ weather**
Overview of the Option	Whenever a metered volume is calculated following receipt of a meter reading, it would still use the standard conversion factor but there would be an additional conversion factor for each day for each LDZ to account for other influences like: - Weighted average height above sea level in the LDZ - Average mix of internal and external meters - Daily correction based on the actual weather in the LDZ compared to the standard temperature in the Thermal Energy Regs Note: the factors will differ by LDZ and by day, some will be greater than 1.00, others will be lower, so metered energy could be increased or decreased.
How the option addresses the Problem Statement (what is the benefit)	By applying an extra stage of conversion this should reduce the error at LDZ level by not assuming that all LDZs operate at the same standard altitude and temperature. This in turn should help to smooth out UIG and reduce it in winter/cold weather and increase it in summer/warm conditions. However, individual metered volumes may still not be correct if the site is not typical of the LDZ.
Phases of Settlement addressed	Nominations (Day ahead forecasts) ☒ Allocations (D+1 to D+5) ☒ Post-Meter Point reconciliation ☒ **NDM** (Class 3 and 4) Nominations and Allocations will only start to improve if/when these extra conversion factors are used in calculating the energy used by the NDM sample. It may be possible to adjust historic sample consumptions rather than wait three years. Until then the benefit is only delivered after meter point reconciliation takes place. For the handful of DM (Class 1 and 2) sites below the 732,000 kWh threshold), daily allocations would also be affected. Note: the average impacts are addressed, but will not be addressed at site level There are other, larger causes of UIG which this solution does not address.
Is the benefit temporary or permanent	Temporary (overwritten by Reconciliation) ☐ Permanent ☒ (See above re NDM Sample data)

OPTION	**4 (ii) Add a new LDZ level factor to the volume-to-energy conversion formula to account for the net difference in energy. The factor would be calculated daily using actual LDZ weather**
Is the option compliant with the Thermal Energy Regs	Yes ☐ No ☒ Not if this volume is used in billing: the Regs state that number of kilowatt hours conveyed = converted volume of gas x average calorific value ÷ 3.6. They also state that converted volume of gas is the register of the meter multiplied by the conversion factor. We would need a legal opinion as to whether we could also multiply by another factor.
Would the solution be able to cope with extreme weather?	Yes: assuming that the factor was not capped and could go as high as required, it should cope with very cold weather. However if it is based on CWV (Composite Weather Variable) it may not be able to react to very warm weather, as the CWV value has a maximum value in each LDZ.
What are the impacts on Supplier billing	These options cannot compel Suppliers to change their billing. But if a Supplier does not change its billing to incorporate the extra conversion factor, it may be billing the end consumer for more or less gas than it is being billed/settled.
What are the impacts on market operations and gas prices	If this results in more accurate Nominations and Allocations it should reduce UIG volatility which might result in a minor improvement in forecasts and therefore more stable prices
What are the impacts on industry party systems	*CDSP* – no change to daily allocation, medium/high change to volume calculation processes (AQ calculation not affected, as it takes the volumes already calculated) and meter read estimation *Shippers* – change required if they wish to mirror CDSP volume calculation in their systems for read validation, AQ calculation, read estimation *Suppliers* – change required if they wish to mirror CDSP volume calculation in their systems for read validation, AQ calculation, read estimation *DNs* – none identified – DN input welcome *NG NTS* – no operational impacts on LDZ measurement or daily Shrinkage amounts; Energy Balancing positions would be slightly different under this approach *Other* – any consumers, especially those with multiple sites, who wish to validate their charges, would need to change their systems if their Supplier uses the extra factor in its billing
What is the impact on System Operation	None identified

OPTION	**4 (ii) Add a new LDZ level factor to the volume-to-energy conversion formula to account for the net difference in energy. The factor would be calculated daily using actual LDZ weather**
What is the impact on Energy Balancing processes	None identified (no change to LDZ measurement or daily allocation processes). Should cause a minor shift in the balance between NDM Allocation and UIG, once the NDM parameters have taken account of the change (see above)
What are the approximate lead times	Likely to be 2 to 3 years, depending on industry governance and CDSP Change Release prioritisation
What are the governance requirements	UNC Modification and CDSP Change Proposal

OPTION	**5: Amend the AUGE process to re-distribute UIG based on estimated impacts of conversion factors (forecast basis) – *Already Implemented***
Overview of the Option	UIG is shared out each day in the Gemini system using a set of UIG Weighting Factors which target UIG to sites based on an assessment of how much those sites contribute to UIG. Sites with a higher contribution have a higher weighting factor. Factors are set for each combination of Class and AQ Band. The Factors are set for each Gas Year by an independent expert, the AUGE (Allocation of Unidentified Gas Expert). This option requires the AUGE to include an assessment of the impact of standard conversion on UIG, by Class/EUC and include an allowance within the factors. **Note: following the work done by the UIG Task Force, the AUGE has included an allowance for these errors in the UIG Weighting Factors for Gas Years 2019/20 and 2020/21. The current AUGE has stated that they will follow the same approach for Gas Year 2021/22.** **(***NG NTS Comment*: Is there merit is awaiting to see the extent of benefit this realises before pursuing other more costly options with long implementation lead times?)
How the option addresses the Problem Statement (what is the benefit)	This approach targets the UIG created by standard volume conversion to the specific EUCs and Classes that create the error. This happens at Allocation stage, based on allocated energy and UIG sharing is adjusted based on metered energy after reconciliation. Each Shipper picks up a share of this UIG in proportion to their share of allocated/measured energy. Individual metered consumptions are not corrected, and the energy impact remains in UIG. The apportionment of the error is based on seasonal normal weather and demands, and is not "adjusted" after the Gas Year based on actual weather or gas usage. There are other, larger causes of UIG which this solution does not address.
Phases of Settlement addressed	Nominations (Day ahead forecasts) ☒ Allocations (D+1 to D+5) ☒ Post-Meter Point reconciliation ☒ Note: the average impacts are addressed, but will not be addressed at site level or amended for actual weather or gas usage
Is the benefit temporary or permanent	Temporary (overwritten by Reconciliation) ☐ Permanent ☒

OPTION	**5: Amend the AUGE process to re-distribute UIG based on estimated impacts of conversion factors (forecast basis) – *Already Implemented***
Is the option compliant with the Thermal Energy Regs	Yes ☒ No ☐ Consumer billing follows the Thermal Energy Regs rules. Suppliers will have their own approach to recovery of UIG costs from the end consumer.
Would the solution be able to cope with extreme weather?	No. This approach uses Seasonal Normal weather conditions to determine the likely amount of UIG, and the UIG Weighting Factors do not vary with the seasons. Cold weather will still result in an increase in UIG on a Gas Day and the opposite for warm weather.
What are the impacts on Supplier billing	None As stated above each Supplier will determine their approach to consumer billing to recovering the cost of any UIG passed on by their Shipper. (e.g. higher unit gas prices or direct pass-through to the consumer)
What are the impacts on market operations and gas prices	None, this does not change the overall daily UIG figure (which is still the balancing figure in each LDZ), it just apportions UIG differently.
What are the impacts on industry party systems	*CDSP* – no change to daily allocation, or reconciliation processes – the UIG Weighting Factors are provided by the AUGE each year *Shippers* – none identified, the only change is to an input parameter in the UIG allocation process *Suppliers* – none identified, the only change is to an input parameter in the UIG allocation process *DNs* – none identified *NG NTS* – none identified *Other* – the AUGE has already changed its Methodology and calculation process to estimate these impacts and include in the final Factors. This calculation needs to be updated each year.
What is the impact on System Operation	None identified
What is the impact on Energy Balancing processes	None identified (no change to LDZ measurement or daily allocation processes). Creates a minor shift in the apportionment of UIG between market sectors/participants, but no system or process changes are required.
What are the approximate lead times	Lead time was approximately 9 months, there is an ongoing annual process to review the Weighting Factors. Weighting Factors are finalised in April each year for the coming Gas Year.

OPTION	**5: Amend the AUGE process to re-distribute UIG based on estimated impacts of conversion factors (forecast basis) – *Already Implemented***
What are the governance requirements	The AUGE has final discretion over the Methodology. The AUG Framework Document could be updated to make inclusion of this error mandatory, to ensure continuity of application. The Framework Document can be updated by majority decision of UNC Committee.

OPTION	**7: Introduce an LDZ level conversion factor (permanent/per year/per month)**
Overview of the Option	The standard national conversion factor would be replaced with an LDZ standard conversion factor, which might be higher or lower than the current national value. This would require an independent exercise to assess the average temperatures, altitudes and pressures for each LDZ. *This differs from 4(ii) in that this option replaces the standard national conversion factor, whereas 4(ii) is an additional factor.*
How the option addresses the Problem Statement (what is the benefit)	By applying a specific tailored factor for each LDZ some of the variation between average UIG levels across the LDZs should be removed. However, individual metered volumes may still not be correct if the site is not typical of the LDZ. There would still be a single factor throughout the year, which would increase UIG in cold weather and reduce it in warm weather.
Phases of Settlement addressed	Nominations (Day ahead forecasts) ☒ Allocations (D+1 to D+5) ☒ Post-Meter Point reconciliation ☒ Nominations and Allocations will only start to improve when these specific conversion factors are used in calculating the energy used by the NDM sample. It may be possible to adjust historic sample consumptions rather than wait three years. Until then the benefit is only delivered after meter point reconciliation takes place. Note: the average impacts are mitigated, but will not be addressed at site level. There are other, larger causes of UIG which this solution does not address.
Is the benefit temporary or permanent	Temporary (overwritten by Reconciliation) ☐ Permanent ☒ (See above re NDM Sample data)
Is the option compliant with the Thermal Energy Regs	Yes ☐ No ☒ No: the Regs state that the converted volume of gas is the register of the meter multiplied by the standard conversion factor. Any LDZ with a different conversion factor would technically be non-compliant.
Would the solution be able to cope with extreme weather?	No. There would still be a single factor throughout the year, which would increase UIG in cold weather and reduce it in warm weather.

OPTION	**7: Introduce an LDZ level conversion factor (permanent/per year/per month)**
What are the impacts on Supplier billing	These options cannot compel Suppliers to change their billing. But if a Supplier does not change its billing to incorporate the specific conversion factor, it may be billing the end consumer for more or less gas than it is being billed/settled. If a Supplier did use these factors in its consumer billing it would be non-compliant with the Thermal Energy Regulations.
What are the impacts on market operations and gas prices	UIG volatility will still exist, but average UIG levels might vary less between LDZs. This is unlikely to have a noticeable impact on gas prices.
What are the impacts on industry party systems	*CDSP* – medium change to volume calculation processes to store and use specific LDZ conversion factors (AQ calculation not affected, as it takes the volumes already calculated) and meter read estimation *Shippers* – change required if they wish to mirror CDSP volume calculation in their systems for read validation, AQ calculation, read estimation *Suppliers* – change required if they wish to mirror CDSP volume calculation in their systems for read validation, AQ calculation, read estimation *DNs* – none identified *NG NTS* – no operational impacts on LDZ measurement or daily Shrinkage amounts; Energy Balancing positions would be slightly different under this approach *Other* – any consumers, especially those with multiple sites, who wish to validate their charges, would need to change their systems if their Supplier uses the extra factor in its billing
What is the impact on System Operation	None identified
What is the impact on Energy Balancing processes	None identified (no change to LDZ measurement or daily allocation processes). Should cause a minor shift in the balance between NDM Allocation and UIG, once the NDM parameters have taken account of the change (see above)
What are the approximate lead times	Likely to be 2 to 3 years, depending on industry governance and CDSP Change Release prioritisation
What are the governance requirements	UNC Modification and CDSP Change Proposal

OPTION	**10: Adjust LDZ daily gas inputs to use standard correction**
Overview of the Option	Gas input into each LDZ is measured by the DN's equipment at the input point or estimated by the DN and at most inputs the gas quality is also measured so that volume is converted to energy using specific daily data. This information also informs the daily Flowed-Weighted Average CV calculation (calorific value). These calculations also account for the temperature of the gas as it passes through the offtake, unlike the standard conversion factor. This option would use the standard conversion factor to calculate the amount of gas brought into the LDZ (instead of the specific measured kWh values).
How the option addresses the Problem Statement (what is the benefit)	By using the same standard conversion factor to calculate the amount of gas brought into the LDZ, the seasonal pattern of UIG should be reduced. This is because gas is being booked into the LDZ in the same "units" as it is being booked out to the majority of meter points. However this option creates a new discrepancy between gas delivered from the NTS into the LDZs, as the volume will be converted into energy differently on the two sides of the offtake. This would be a new source of Unaccounted For Gas on the NTS. It also creates a new source of UIG for sites with non-standard conversion factors or with daily conversion equipment, as they will not calculate energy consistently with the LDZ inputs. There are other, larger causes of UIG which this solution does not address.
Phases of Settlement addressed	Nominations (Day ahead forecasts) ☒ Allocations (D+1 to D+5) ☒ Post-Meter Point reconciliation ☒ Nominations will only improve if the Network Operator forecasts gas usage in volume terms and converts it using the standard factor. Note: the average impacts are mitigated, but will not be addressed at site level, where the prevailing conditions could be different from the assumptions in the standard conversion factor.
Is the benefit temporary or permanent	Temporary (overwritten by Reconciliation) ☐ Permanent ☒

OPTION	**10: Adjust LDZ daily gas inputs to use standard correction**
Is the option compliant with the Thermal Energy Regs	Yes ☒ No ☐ Yes, assuming that non-standard conversion is still used for larger sites, as required by the Thermal Energy Regs
Would the solution be able to cope with extreme weather?	Yes, within the LDZ. However there would still be a seasonal pattern to the UIG created by larger sites with non-standard conversion: they will contribute positive UIG in cold weather and negative UIG in warm weather. The discrepancy between the NTS and the LDZs, which will be similar to CV Shrinkage, will tend over-measure in cold weather and reduce NTS Unaccounted for Gas and under-measure in warm weather, increasing NTS Unaccounted for Gas.
What are the impacts on Supplier billing	None identified
What are the impacts on market operations and gas prices	UIG volatility will still exist, and UIG will still have a seasonal pattern. National Grid NTS may need to recover the additional "Unaccounted For Gas" on the NTS from Shippers via existing Shrinkage procurement processes. This is unlikely to have a noticeable impact on gas prices.
What are the impacts on industry party systems	*CDSP* – little or no change – LDZ measurements are received as energy, not volume *Shippers* – little or no change *Suppliers* – little or no change *DNs* – change to their measurement systems/processes to determine input gas *Other* – NG NTS – likely change to their measurement/validation systems for LDZ inputs, new source of Unaccounted for Gas to track and investigate, additional costs would be passed on to Shippers
What is the impact on System Operation	Additional source of Unaccounted for Gas, which NTS will need to track and monitor
What is the impact on Energy Balancing processes	Could make it harder for parties to balance each day if their system input quantities are calculated using different basis to their system offtakes.
What are the approximate lead times	Unknown at present, requires all DNs to make changes, so will have to move at the pace of change of the slowest/most heavily impacted.
What are the governance requirements	UNC Modification and DN/NTS internal change processes

OPTION	**11: Adjust daily gas allocations and subsequent meter point reconciliations to take account of impact of actual weather on metered gas volumes.**
Overview of the Option	Daily gas allocations are currently calculated using standard usage profiles for Non-Daily Metered sites. This option would amend the daily allocation process to include a daily calculation of the impact of actual weather on gas volumes, at an LDZ level, in addition to the Weather Correction Factor that is already part of the NDM Algorithm process. The calculations could be extended to cover larger NDM sites, which are required to have a site specific conversion factor. This would require an agreed formula for the daily impact of weather on gas volumes, at LDZ level, taking account of average altitudes, operating pressures and the mix on internal and external gas meters. The same adjustments would need to be used to calculate meter volumes, so that Reconciliation did not undo the new allocations. In which case (see below) the calculated energy would be inconsistent with the Thermal Energy Regs.
How the option addresses the Problem Statement (what is the benefit)	This option would flex daily NDM allocations in line with the impacts of LDZ level weather on gas volumes. Cold weather allocations would tend to increase and warm weather allocations would tend to decrease. This should remove some of the variation between average UIG levels across LDZ and within year. However, individual metered volumes may still not be correct if the site is not typical of the LDZ.
Phases of Settlement addressed	Nominations (Day ahead forecasts) ☒ Allocations (D+1 to D+5) ☒ Post-Meter Point reconciliation ☒ (assuming that the same adjustments are applied to Reconciliations) Note: the average impacts are mitigated, but will not be addressed at site level. There are other, larger causes of UIG which this solution does not address.
Is the benefit temporary or permanent	Temporary (overwritten by Reconciliation) ☐ Permanent ☒ Permanent if incorporated into Reconciliation.

OPTION	**11: Adjust daily gas allocations and subsequent meter point reconciliations to take account of impact of actual weather on metered gas volumes.**
Is the option compliant with the Thermal Energy Regs	Yes ☐ No ☒ No, if we assume that the same adjustments are used in the calculation of metered energy for the reconciliation process. If they are, then energy is not being calculated as required by the Thermal Energy Regs.
Would the solution be able to cope with extreme weather?	Yes: assuming that the factor was not capped and could go as high as required, it should cope with very cold weather. However if it is based on CWV (Composite Weather Variable) it may not be able to react to very warm weather, as the CWV value has a maximum value in each LDZ. Depending on the approach to larger sites with a non-standard conversion factor requirement, there would still be a seasonal pattern to the UIG created by those larger sites: they will contribute positive UIG in cold weather and negative UIG in warm weather. This assumes that their site-specific conversion factor is used to derive their actual energy.
What are the impacts on Supplier billing	None identified
What are the impacts on market operations and gas prices	UIG volatility will still exist, and UIG will still have a seasonal pattern.
What are the impacts on industry party systems	*CDSP* – high change to daily NDM gas allocation processes (currently held in Gemini) and medium change to volume calculation (AQ calculation not affected, as it takes the volumes already calculated) and meter read estimation *Shippers* – change required if they wish to mirror CDSP allocation and volume calculation in their systems for read validation, AQ calculation, read estimation *Suppliers* – change required if they wish to mirror CDSP allocation and volume calculation in their systems for read validation, AQ calculation, read estimation *DNs* – none identified *NG NTS* – change to Gemini systems *Other* – any consumers, especially those with multiple sites, who wish to validate their charges, would need to change their systems if their Supplier uses the extra factor in its billing
What is the impact on System Operation	None identified, as there is no change to the determination of energy offtaken from the NTS

OPTION	**11: Adjust daily gas allocations and subsequent meter point reconciliations to take account of impact of actual weather on metered gas volumes.**
What is the impact on Energy Balancing processes	None identified (no change to LDZ measurement or daily allocation processes). Creates a minor shift in the apportionment of UIG between market sectors/participants, but no system or process changes are required.
What are the approximate lead times	Likely to be 3+ years, depending on industry governance and CDSP Change Release prioritisation, including dependency on Gemini change programme
What are the governance requirements	UNC Modification and CDSP Change Proposal