Future Billing Methodology

Further Q&A

This document covers some of the questions received on the project so far. If you have a question that is not covered by this document, please contact the Project Manager David Chalmers (david.chalmers2@nationalgrid.com).

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Project – general (inc. about the consultation)

Q **Apart from low carbon gases, what other options are available to provide low carbon heat for GB customers?**

A Recent UK energy policy for decarbonisation has focused on ultimate electrification of heat, combined with increased renewable generation and the use of high-efficiency appliances such as electric heat pumps in homes and businesses.

This raises a number of challenges. Most notably, the need to re-engineer the electricity networks to provide the significant additional system capacity and response capability that would be required to meet the very large diurnal and seasonal swings in heat demand which are currently served by gas. This, together with the need for increased power generation capacity for heat, is why the cost estimates for future electrification of heat to 2050 are so high, at around £300bn.

Low carbon heat alternatives to electrification include Combined Heat and Power. This typically requires 'high dwelling density' arrangements, such as compact housing estates and multi-occupancy buildings. It requires specific planning and administrative arrangements, which can be costly for existing housing and has long lead-times.

Other non-gas alternatives include a range of dwelling-specific renewable solutions, which tend to be expensive, and which still require an electricity grid connection to meet higher heat demands. Although technology advances may increase the range of options available, it is likely that these would also involve high initial expense for consumers.

Q **If this project moves to implementation in the future, what are the potential for carbon savings from alternative sources of gas?**

A An initial analysis of the direct benefits of implementing a Future Billing Methodology arrangement indicate Net Present Value cumulative savings to 2050 in the range of £170m -

£300m, with 1 - 2 million MTCO2e* carbon savings from the removal / avoidance of propane enrichment of renewable gases. This analysis was based on two of National Grid's 2016 Future Energy Scenarios "Gone Green" and "Slow Progression". (Access the Future Energy Scenarios here).

More fundamentally, a CV zone based billing framework would help to unlock the decarbonisation of GB gas distribution networks, by opening the door to all Gas Safety (Management) Regulations (GS(M)R)-compliant gases, including renewable gases from waste and other low carbon gases, such as hydrogen blend. This would bring benefits to gas customers through being able to retain their existing heating systems. Greater diversity of gas supply could also result in lower unit costs than would otherwise be the case.

** Metric tonnes of carbon dioxide equivalent. A metric measure used to compare the emissions from different greenhouse gases based upon their global warming potential.*

Q **Why not concentrate on amending the gas regulations to support the removal of propane?**

A The attribution of energy to gas flows into the LDZ networks are governed by Paragraph 4A of the Gas (Calculation of Thermal Energy) Amendment Regulations 1997. This framework calculates flow-weighted average energy content (Calorific Value or 'CV') within each of the 13 Local Distribution Zones (LDZ) in GB for billing purposes. It has a narrow CV tolerance (1 MJ/m^3 above lowest source) for each LDZ to protect customers from being overbilled for lower CV gas.

Simply removing this cap would result in ever greater cross subsidisation of gas energy costs by customers receiving low CV gas, as supplies of renewable and other low carbon gases increase over time. We believe that by understanding the zones of influence of each input gas source, we can create new CV charging areas and continue billing customers for the gas energy they receive. This would enable us to realise the full benefit of renewable and other low carbon gases.

Q **What is the cost of propane input for biomethane supplied under RHI?**

A Biomethane is currently about 0.5% of supply and propane is costing around £2m per annum.

Q NEW **The implementation of the project could involve major changes to the system which are difficult to quantify for the cost-benefit analysis at this stage if we don't know exactly what will be needed?**

As a central part of the project, we will liaise with Xoserve to explore ways in which CV zones could be created and reflected in meter point data to drive commodity, reconciliation and Non-Daily Metered (NDM) demand estimation calculations. However, an early view of how this might translate to billing is that commodity and reconciliation invoice data would be structured to reflect the CV zone and CV for the meter point being billed.

Q NEW **Why isn't an implementation project being run in tandem with FBM to understand the implications of implementation more fully?**

The FBM project has been deliberately set as a "Proof-of-Concept". This is because we must first understand the zones of influence exerted by embedded inputs to the LDZs, such as biomethane; and establish that zones of influence can be configured in a robust way for the purpose of billing for gas energy transported. This is also why it is an "innovation" project.

It would not be practicable, or a productive use of limited resources to launch an implementation project before the principles have been established, nor would it be appropriate to fund the latter through the innovation incentive.

Q NEW **Why are you doing this now when there is no clear policy direction?**

The FBM project is a response to the imperative for the UK to reduce its emissions by 80% on 1990 levels by 2050, and the facts that (a) the bulk of heat is presently fuelled by gas; and (b) that no alternative energy infrastructure exists that has the capacity and capability to handle the very significant diurnal and seasonal swings in heat-driven demand.

In our view it should be the role of industry to explore and create the options that could inform future policy, particularly given the urgency of the challenge and the lack of traction in decarbonising the heat sector to date.

We accept that the implementation of FBM would not, in itself, bring about the decarbonisation of heat. However, our view is as follows:

- GB's gas distribution networks are an existing multi-billion pound energy infrastructure asset that has been contributed to by gas customers for many decades. It is physically capable of delivering renewable and low-carbon alternative gases for fuelling heat today, but the present FWA CV regime effectively precludes decarbonisation, due to the need to enrich low CV gases.
- Until the point at which universal gas energy metering can be achieved, a CV zone based billing framework, such as that envisaged by FBM, is an essential enabler to the decarbonisation of the existing gas grids.
- Removing the need for costly enrichment of low CV gas would act as a catalyst to maximise the generation and deployment of renewable gases from recycled waste, together with low carbon alternatives such as hydrogen blend.
- Given the above we believe that, with implementation of FBM, up to 100TWh p.a. renewable gas and low carbon alternatives could be delivered through the existing gas distribution network by 2050 (around one third of today's annual gas distribution demand). In addition, hydrogen electrolysis from constrained-off renewables could potentially realise a further 29TWh by 2050. Taken together, along with further developments in thermal efficiency of homes and appliances through normal boiler replacement; this could fuel a significant proportion of future heat demand, and hence avoid a sizeable proportion of the electrification investment that would otherwise be required to decarbonise heat for 2050.

Q NEW **Who would pay for the costs of implementation?**

As was the case for other changes in gas transportation billing, the cost of implementing a

different billing methodology such as that explored in this project, would ultimately be borne by gas customers through charges for the gas they use. However, we believe that the additional cost per gas customer for implementing FBM could be significantly lower than changing away from gas to an alternative heating fuel such as electricity, retrofitting heat networks to CHP plant, or other alternatives.

Q **What is the timeframe for potential implementation?**

The FBM project will, subject to Stage Gate 1 acceptance by Ofgem, continue until the end of March 2020. Should implementation of either the *Pragmatic* or *Composite* Options be recommended at that point (bearing in mind that the Ideal Option is exploring a longer-term scenario), then a separate industry implementation project would be set up, including the necessary code modification proposals.

As such, we would expect implementation to occur no earlier than 2021/22.

Flow-Weighted Average Calorific Value (FWACV)

Q **What range of calorific values is this project considering as likely to make up future gas supplies?**

A The GS(M)R sets out the allowable range of Wobbe Number rather than calorific value. The Wobbe Number is closely related to the calorific value but it is not quite the same as it governs the range of gases that will burn safely on gas appliances in GB. As an approximation, calorific values could vary between 37 and 42 MJ/m^3 but all gases must also comply with all the other requirements of GS(M)R.

Note that GS(M)R is under review. During 2016, SGN concluded a Network Innovation Competition (NIC) project called “Opening Up the Gas Market” which involved a year-long field trial of higher Wobbe Number gas injected and used within Oban. In review of the findings, they have recommended that the upper Wobbe Number limit be increased. In conjunction, they have recommended that the Gas Quality specification contained in GS(M)R is transferred to an IGEM standard. An industry working group has been established by IGEM to explore this further.

Q **How would changing zones be accommodated through billing?**

A The project will consider how the low CV boundary moves, both diurnally and seasonally. Changes in CV zones will be observed, analysed and typified through field trials and other analysis. The overall analysis will consider how the boundary is best defined and the potential impact of various options on consumers’ bills.

Our initial thinking is that the charging area boundaries will be fixed unless there are new connections or significant new demands on the network. Note that there are existing network planning activities for any new connections or demand on the gas network – the definition of zones of influence to determine charging areas will simply be an additional activity that should be carried out. How the boundaries will be specified will form part of this innovation project and there is an opportunity for stakeholder engagement in phase four of the project. The case for time-based flexing of CV zones will be considered alongside practicality of implementation in billing systems.

Q **What are the current variations in bills under the FWACV system?**

A Under the current FWACV system there are some small variations in bills for customers receiving gas with the same energy content. These reflect the small variations in CV from the input sources to each of the LDZs.

Early high-level estimates suggested that the existing regime could allow final billing differences between high and low CV sources for the same energy requirement of up to £17 per annum, but this may be overstated, as the split between fixed and volume-variable charges could not be accounted for.

Q **Can anything be done on FWACV or at the plant itself?**

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The central problem is that to avoid potentially significant distortion in the billing of gas energy transportation in the LDZ, the existing FWACV regime effectively mandates the enrichment of any quantity of low CV gas entering the LDZ network to standardise gas energy content across the LDZ.

The only way to break down this barrier to decarbonisation is to reflect the actual energy content of the gas being transported to customers.

Simply removing the FWACV cap and removing the enrichment requirement in NEAs would result in ever-increasing cross-subsidisation of gas energy costs for "high-CV" customers by those receiving low CV gas, as the take up of renewable and low carbon alternative gases increased over time.

In the absence of universal gas energy metering, which would take many years to achieve, the only practicable alternative is to create a zonal billing structure that is reflective of the zones of influence exerted by embedded inputs with atypical CV, such as biomethane entry sites.

Customers

Q **How could Future Billing Methodology help consumers to save money?**

A The Climate Change Act established a target for the UK to reduce its emissions by at least 80% from 1990 levels by 2050. This means moving to a low carbon energy future. 80% of residential heat emissions come from gas heating, so decarbonisation of heat is vital. However, decarbonisation of energy and heat in particular, will involve changes to the energy network and changes for consumers.

The existing gas distribution networks are a multi-billion pound asset, paid for by gas customers over many decades. These networks are flexible, resilient and are physically capable of transporting low carbon gases to customers.

This project aims to unlock the gas energy billing framework to deliver all safe low carbon gases without needing to add in costly, high-carbon treatments. This would maximise use of the existing gas grid to deliver low carbon energy in a way that is convenient for customers,

as they could continue to use their existing heating systems into the future.

Unlocking the transportation of all safe gases, including renewable gases and low carbon alternatives would widen the supply market and could also help keep gas costs lower than they would otherwise be.

Using the existing gas networks to deliver low carbon heat energy would also help avoid very high future costs that would be incurred if electricity networks had to be re-engineered to deliver electric heating instead of gas to the 80% per cent of homes that currently use gas heating.

Q **The calorific value (CV) of gas is currently averaged so consumers are all billed in the same way. So, if the CVs of gas are varied, what impact will this have on a customer's bill?**

A The Future Billing Methodology project aims to continue billing gas customers on the energy that they use. Provided the billing mechanism takes proper account of day-to-day changes in the CV of the gas, the customer should not be adversely financially impacted.

- A customer supplied with a low calorific value gas will consume a greater metered volume for a fixed energy content.
- A customer supplied with a high calorific value gas will consume a lower metered volume for the same fixed energy content

The end bill for both customers will take account of the energy content (calorific value) and the volume, therefore the charge will be the same for both, for the same energy requirement.

Q **How would different calorific values of gas impact customers' appliances?**

A All gas appliances in GB are built to comply with the EU Gas Appliance Directive, which will become part of UK law. All sources of gas allowed onto GB gas transportation networks, including renewable gases such as biomethane, must comply with GS(M)R, which govern the chemical composition and burn quality of gas. Customers' appliances should therefore operate safely within the tolerances set under GS(M)R with no alterations required.

Q **Will this project consider the possibility of assigning customers to two or more inputs for billing?**

A A customer may be located on the boundary between the zones of influence of more than one LDZ entry point. Our field trials and analysis will help us to understand how, when and where these zones of influence can flex. This will enable us to develop a way of determining a robust CV Zone structure for billing that strikes an appropriate balance between responsiveness and practicability. However, it will also provide essential learning on the potential limitations and customer impacts.

It might be possible to attribute end users to different CV measurement points at different times of the year (summer/winter) if the analysis suggested a clear benefit for this; and systems could be changed to accommodate it. This will be considered in the project.

The three options and the field trials

Q **How accurate will the field trials be?**

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A The measurement uncertainties will be about 5% for flow, 1% for pressure and 1.5% for CV.

The oxygen sensors for tracking biomethane in the networks have an uncertainty of up to 5%, which is appropriate to determine the presence, or otherwise, of biomethane. This data will be sufficiently accurate to be used as a comparator against the results from the Chittering and Hibaldstow network models.

The intention is to develop a planning procedure that could be applied to any network model when determining a billing zone around a low CV entry point.

Q **Regarding the Ideal Option being explored under FBM, can the current specification smart**

NEW **meters already being installed in gas customers' homes hold CV data? If not, what is the timescale being envisaged by this option? Do you envisage a further roll-out of higher spec meters, at what cost to the customer?**

The current roll-out of SMETS2 compliant smart meters do have auxiliary input points and one of these will be used to receive live CV data during the field trials. The *Ideal* option of the project will also show the measurement data, meter balance and the cost of the gas consumption on the in-home display.

To use the CV data to generate consumer bills, an update to the firmware may be required. The project aims to answer this question using a fully functioning smart meter System at the DNV GL Technical Assurance Laboratory facility in Peterborough. This will aim to:

- demonstrate the technological proof of concept that smart meters can be used to provide retail energy Suppliers with converted data to generate accurate consumer bills;
- outline the requirement for future developments of Smart Meters and communications systems to deploy the Ideal solution (or a close facsimile using current technology); and
- liaise with industry stakeholders to estimate the costs and timeline of implementing the link between smart meters and the billing system.

Misc. questions

Q **Doesn't the next phase of SMART metering include new CV measurement? How does that fit with this project?**

A It will take many years to develop and roll out smart gas energy measurement meters.

The *Ideal* solution being explored as Option 3 in the FBM Project could deliver a transitional pathway to an energy metered world, given the urgency of emissions targets.

Q **What will happen if a source of gas supply is interrupted?**

A The learning gained from undertaking the field trials in this project will generate suggestions

on how a loss of supply would be dealt with. Initial thoughts would be that the CV for that area would revert to the LDZ FWACV during a loss of supply period.

Q **What is the gas billing period?**

A The Gas (Calculation of Thermal Energy) Regulations (G(CoTE)Regs) do not prescribe any billing period.

The "gas period" referred to in Regulation 3 of G(CoTE)Regs, is defined as "one or more successive gas days". FWACV is calculated for each gas day and, for gas transportation billing, billable quantities are calculated for each day in the billing period (calendar month). Billing customers for the gas energy they receive relies on this arrangement being reflected throughout the gas supply chain and this would remain the case under a CV zonal billing arrangement, if implemented.

Q **If it goes through to implementation, would fences need to be put around every**
NEW **biomethane plant to determine the zone of influence?**

It would not be practicable to physically secure the zone of influence exerted by any input point to the LDZ pipeline network. The analytical work that will be done using data collected from the proposed field trials will aim to produce a scalable, replicable set of rules that can be applied in any LDZ to determine a robust zone of influence for the purposes of billing.

As part of the FBM project, we will also explore how a CV zone can be identified. This is for the purpose of linking CV Zone and CV data to meter point data, to drive the relevant chargeable quantities and Non-Daily Metered demand estimation calculations within the new transportation billing system.

Glossary of acronyms

Acronym	Meaning
CV	Calorific Value – The energy content of gas (CV) is measured in mega Joules per cubic metre of gas at standard temperature and pressure.
CVDD	Calorific Value Directed Device - A Calorific Value measurement device that is specifically directed by Ofgem as approved for the purpose of transporters complying with the Gas (Calculation of Thermal Energy) Regulations in measuring the quantities of gas energy transported through gas networks in Great Britain.
FWA	Flow-weighted average – Gas energy allocation and billing for gas transported through the Local Distribution Zones is currently based on a daily flow-weighted average Calorific Value for each Local Distribution Zone.
FWA CV	Flow-weighted average Calorific Value.
G(CoTE)Regs	Gas (Calculation of Thermal Energy) Regulations.
GSMR	Gas Safety (Management) Regulations.
IGEM	Institution of Gas Engineers and Managers.
LDZ	Local Distribution Zone – Great Britain's gas distribution networks comprise 13 discrete regional pipeline networks, known as Local Distribution Zones.
LNG	Liquefied Natural Gas – Imports of fossil-based Liquefied Natural Gas make up an increasing proportion of GB gas supply.
NDM	Non-Daily Metered gas.
NEA	Network Entry Agreement.
NIC	Network Innovation Competition – in this case, Ofgem's Gas Network Innovation Competition.
NTS	The (Gas) National Transmission System - The national network of high pressure gas pipelines which provides bulk transportation of gas from beach terminals and Liquefied Natural Gas facilities to directly connected National Transmission System loads and around 23 million customers connected within the 13 Local Distribution Zones.
SMETS	Smart Metering Equipment Technical Specifications.
Wobbe	The Wobbe number is the main indicator of the interchangeability of fuel gases and is frequently defined in the specifications of gas supply and transport utilities. It is used to compare the combustion energy output with different composition of fuel gases.