

NIC04 – Project Progress Report 1 December 2017



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1 Executive Summary

The Future Billing Methodology (FBM) NIC Project runs from April 2017 to March 2020 and explores three options to provide a “proof-of-concept” framework for a more specific way of attributing the energy content of gas (calorific value or CV) to volumes in GB’s gas distribution networks for billing purposes. Each of the three options being explored involves the development of CV zones within each Local Distribution Zone (LDZ), and is supported by field trials.

The primary driver for this project is to identify a robust, cost-effective option to support the decarbonisation of heat to help meet the UK’s 2050 emissions target. The aim is to achieve this using Great Britain’s existing gas distribution networks to transport renewable and other low carbon gases without the need for enrichment with fossil-based gases to standardise its energy content (calorific value or CV) for billing purposes.

The project comprises two main phases: Phase 1, completed in August 2017, pursuant to the terms of the Project Direction, involved an initial industry engagement event and consultation, which was successful in demonstrating industry support for the project and field trial to explore alternatives to the current LDZ flow-weighted average CV framework for gas transportation billing (see Table 2-3). This engagement also identified a number of potential changes to regulations and industry codes to support future implementation (see table 2-4).

Phase 1 also included an initial project cost-benefit analysis (CBA). This built on the initial project submission to take account of potential implementation costs and a deeper assessment of the projected benefits, particularly in terms of the cost of carbon saved. This initial CBA demonstrated a strong positive NPV for all three future billing options being explored (see Tables 3-7 and 3-8).

Phase 1 concluded with the project Stage Gate, at which Ofgem determined that the conditions of the Project Direction had been met and that the project could progress to the field trials and onwards to conclusion.

Ofgem’s Project Direction also provided for preparatory work to ensure the field trial could go ahead in a timely manner. This involved modelling to refine the selection of measurement site locations and the production of generic model designs for sensor installations at 40 governor stations and 15 roadside kiosks in the East of England.

Phase 2 of the project to date has focused on detailed preparation for the installation of the field trial measurement points. This has involved a detailed review and iterative improvements to the initial model designs to ensure reliability and security of the installations; also to minimise visual impact and support detailed planning for the Streetworks element of the roadside installations. This detailed review has extended the design phase of the project and so timing within the construction phase is being revisited to maintain the delivery completion target in early September 2018.

The project-critical requirement is that all measurement points are installed, tested and fully commissioned by early September 2018, to ensure the full 12-month measurement exercise can be

completed in time to support the timely delivery of the final phase of the project. Whilst the project team will strive to avoid delays, any threat to timely project delivery will be communicated to Ofgem.

During Phase 2, the project team has also continued liaison with Xoserve and National Grid's Gas Transmission team, to gain a clearer understanding of the potential impacts that the implementation of each FBM Option will have on the gas transportation billing process and the provision of CV information for downstream billing. A report on our initial findings will be submitted to Ofgem on 31st March 2018.

2 Project Manager's Report

Introduction

The Future Billing NIC Project runs from April 2017 to March 2020 and explores three options to provide a “proof-of-concept” framework for attributing the energy content of gas (calorific value or CV) to volumes in GB’s gas distribution networks in a more specific way for billing purposes. Cadent is working in partnership with DNV GL on this project.

This £5.4m NIC project aims to provide the basis for a billing framework that will remove the need to enrich lower-carbon gases, such as biomethane from renewable sources, with high carbon fossil-based gases such as propane. This will unlock the full benefit of renewable-source gases and facilitate the decarbonisation of heat using existing gas networks. The three options are summarised as follows:

- **Pragmatic** – Creation of billing zones for specific LDZ-embedded input points, such as biomethane injection sites, using modelling techniques.
- **Composite** – Creation of billing zones for every input point, using modelling and within-network CV measurement.
- **Ideal** – Explores the use of smart meters in attributing CV measured at specific points on the gas distribution network for billing, as a precursor to direct gas energy metering in the future.

Ofgem awarded the Future Billing Methodology (FBM) NIC project to Cadent (formerly National Grid Gas Distribution Ltd) on 30th November 2016. However, Ofgem introduced a stage gate under the Project Direction of 16th December 2016, which effectively restructured the project into Phase 1 and Phase 2. For the purposes of this document, the simpler “Phase 1 / Phase 2” structure has been used from this point and for reference back to the Project Direction and revised Project Submission in December 2016. A mapping of Work Pack components to Project Phases is provided in table 2-1, below.

Table 2-1 – Mapping Work Packs to Project Phase

Project Phase	Work Pack Ref.	Activity
Phase 1	1a	Industry engagement & Stage Gate Report
	2a	Preparation for Field Trial
	4a	Initial Cost Benefit Analysis
Phase 2	1b	Second industry engagement – industry dialogue on project findings and project final report
	2b	Finalise preparation; conduct field trial, including analysis, modelling and sharing of findings
	3	Smart Metering field trial
	4b	Final project Cost Benefit Analysis

FBM Project Phase 1

Phase 1 of the project comprised initial industry engagement and delivery against the conditions set out in Ofgem’s Project Direction, which required that Cadent prepare a report setting out the following from its industry engagement activities, as shown in Table 2-2, below.

Table 2-2 – Ofgem Project Direction Stage Gate requirements

Requirements for Cadent from Industry Engagement:		
a)	Industry’s current views on the desire for change to the current approach.	
b)	Industry’s current views on:	
	i)	What level of modelling validation is seen to be required; and
	ii)	What regulatory (or other) changes are required to support the continuation of the Project beyond Work Pack 1.
c)	Initial Cost Benefit Analysis of the three scenarios (noting that this will be finalised under Work Pack 4) to demonstrate that, following industry engagement, there remains a strong case to proceed with the Project.	
d)	Based on a, b, and c, Cadent’s assessment of the best way to proceed with this Project.	

Ofgem also brought forward £250,000 to support activities associated with preparation for Phase 2. The project team has identified the measurement sites for the field trials around the biomethane inputs at Chittering and Hibaldstow. Site surveys have been carried out and detailed generic design packs have been prepared in accordance with Cadent's policies and specifications. This should enable the project to proceed smoothly and efficiently into Phase 2 without undue delay and to adhere to the original three-year time-line set out in the NIC submission document.

A summary of how the project has delivered each of the requirements (a) to (d) is given below.

a) Industry's current views on the desire for change to the current approach

Cadent's project consultation demonstrated agreement from most respondents that the Flow Weighted Average Calorific Value (FWACV) billing framework presents a barrier to the adoption of low-carbon gases to decarbonise heat. There was concern expressed over the impact on shippers, suppliers and gas distribution networks due to increased data management and implementation of changes to the billing system. In response, Cadent is working with Xoserve and National Grid's Gas Transmission business to start identifying the necessary changes to billing-related systems and processes. The results of this work will be used in further engagement with shippers and suppliers in Phase 2 of the project to allow them to begin assessing the scale of related changes to their billing systems and interaction with customers.

b) Industry's current views on:

i. What level of modelling validation is seen to be required

Stakeholders agreed that the proposed measurement and validation field trials could provide an understanding of the zones of influence of LDZ embedded gas entry points. This would enable customers to be assigned to the correct input point and to be billed more accurately for the energy content of the gas that they receive. Many additional factors were suggested by stakeholders for inclusion in the Project including Local Distribution Zone (LDZ) operation and smart meter configurations. Whilst many of the suggestions are outside the scope of this project, they have been noted and the key outcomes will provide more information.

A large proportion of stakeholder responses have referred to the need for a full end-to-end impact assessment for FBM implementation. As FBM is an innovation project, it is not possible to undertake a full impact assessment without first undertaking the learning and assessing the outcomes. As part of Work Pack 4, the key learning points will be disseminated to the industry in further stakeholder engagement.

An initial CBA was prepared for Phase 1. As part of the second phase, the initial CBA will be updated based on the outcomes of the field trials and the further industry dialogue.

The outcomes from the FBM project consultation were analysed in detail within the project Stage Gate report. However, a summary of consultation responses is provided in Table 2-3, below.

Table 2-3: FBM Industry Consultation Responses Summary

**FBM Project Consultation
as at 12 May 2017 -
Y/N Responses at a Glance**

Key:	Y	Support
	O/P	Partial agreement / non-committal
	N	Against
	-	No Comment

Question		Org Type:	GDN	Shipper / Supplier	Industry Bodies	Producer / Producer Bodies	Tech / Other	Total
		Number of Respondents:	3	4	1	3	5	16
1	Do you agree that the existing LDZ FWACV methodology presents a barrier to a low carbon gas future and that alternative methodologies should be explored?	Y	3	1	1	3	5	13
		O/P	-	1	-	-	-	1
		N	-	2	-	-	-	2
		N/A	-	-	-	-	-	-
2	Do you agree that the Future Billing Methodology Project could provide the basis to deliver an economical and sustainable pathway to decarbonising heat for 2030 and 2050?	Y	3	1	-	3	5	12
		O/P	-	1	1	-	-	2
		N	-	2	-	-	-	2
		N/A	-	-	-	-	-	-
3	Do you agree that the proposed Measurement and Validation Field Trials could provide an understanding of the modelled zones of influence of LDZ-embedded gas entry points?	Y	3	4	1	2	3	13
		O/P	-	-	-	-	-	-
		N	-	-	-	-	1	1
		N/A	-	-	-	1	1	2
Totals		Y	9	6	2	8	13	38
		O/P	-	2	1	-	-	3
		N	-	4	-	-	1	5
		N/A	-	-	-	1	1	2

ii. **The regulatory (or other) changes are required to support the continuation of the Project beyond Work Pack 1**

FBM was designed to minimise changes to legislation, but through the engagement phase and as our thinking develops, it is recognised that some changes to regulations and codes will be necessary to support the implementation of a Future Billing Methodology Regime. The changes identified so far are set out in Table 2-4, below.

Table 2-4 – Changes to industry codes / regulations identified in Phase 1 engagement

Changes to Industry Regulations / Codes for FBM Implementation:	
G(CoTE)R	- For <i>Composite</i> and <i>Ideal</i> options – Amendment will be required to recognise within-LDZ CV measurement - For all options – may need amendment referring to OAD (see below) for “charging areas” to support CV zone definition for billing
GS(M)R	Amendment required to support future deployment of hydrogen in gas distribution networks (being explored with HSE in Cadent’s HyDeploy NIC project and other NIA projects)
UNC (TPD)	Creation of CV zones within LDZs for billing will require changes to the Transportation Principal Document – FBM project will map changes out at high level.
UNC (OAD)	Creation of CV zones and corresponding “charging areas” will require change to Offtake Arrangements Document and possibly an ancillary document defining these in relation to specific input or CV measurement points (links directly to G(CoTE)R changes)
Smart Energy Code	Possible changes required to this and DCC (Data Communications Company) system specification to support implementation of <i>Ideal</i> solution (longer-term option) – FBM will identify at high level

c) **Initial Cost Benefit Analysis of the three scenarios (noting that this will be finalised under Work Pack 4b) to demonstrate that, following industry engagement, there remains a strong case to proceed with the Project.**

Cadent undertook a high-level analysis of the gas supply chain. Costs and benefits were identified and assessed to compare the status quo with each of the FBM options. This initial CBA built upon the original NIC Project Submission to take account of potential implementation costs for each of the three FBM options; and re-evaluated the potential benefits. The resultant Net Present Values (NPVs) were strongly positive for each FBM option against each of the National Grid 2017 Future Energy Scenarios (FES). The methodology and results are described in more detail in Section 3 of this report.

d) Based on a, b, and c, Cadent's assessment of the best way to proceed with this Project

Cadent's assessment was that the FBM project should progress through the field trials to its conclusion. Based on the positive feedback to the FBM project consultation, the strongly positive NPV from the initial CBA, and the indication that a gas-centred solution to decarbonising heat, facilitated by FBM, could cost GB energy consumers considerably less than a non-gas-based approach.

This would deliver the learning required to make a fuller cost-benefit assessment of billing consumers using an FBM approach and equip the industry with an economically favourable option to decarbonise heat in a way that balances effectiveness with affordability for customers and continued security of supply.

Cadent submitted the FBM Project Stage Gate report containing the above to Ofgem on 10th August, in line with the Project Direction timetable. The full Stage Gate report is available on the project web site www.futurebillingmethodology.com.

Ofgem Decision on Stage Gate

On 20th September 2017 - Ofgem responded to Cadent's Stage Gate submission, agreeing that Stage Gate conditions have been met and formally consented to the spending of NIC funding associated with Work Packs 2, 3 and 4.

Cadent's view is that successful delivery of Phase 1 of the project meets Ofgem Successful Delivery Reward Criteria (SDRC) 9.1(a).

FBM Project Phase 2

The elements comprising Phase 2 of the project are set out in Table 2-5, below.

At present, detailed design packs are being finalised for authorisation in readiness for the procurement of instrumentation components and materials, ahead of the commencement of the planned field trial installation programme in February 2018.

Table 2-5 – Elements comprising Phase 2 of the FBM project

Item	Activity	Timing	Objective
Project Field Trials	Field trials will be undertaken around two selected biomethane injection sites – Hibaldstow (East Midlands LDZ) and Chittering (East Anglia LDZ);	Oct-18 - Oct-19	Empirical observation of changes to biomethane zone of influence under one full year of operation. Analysis and modelling development of algorithms to determine CV zones.
Smart Metering Trial	Carry out at an off-line gas network simulation facility, drawing live CV data from specific measurement sites within the field trial areas;	Dec-18 – Oct-19	Trial the capabilities of current smart meters and understand the implications for data hierarchies and flows to facilitate a key evolutionary step towards smart gas energy metering.
Share Project Findings, comprising:			Outputs will inform second industry engagement and dialogue on potential implementation costs and impacts for final project CBA and recommendations.
Field Trial Results	Share measurement analysis and modelling of CV zone algorithms. Explain basis and factors affecting.	Oct-19 and Dec-19	
Smart Meter Trial Results	Share findings on meter capabilities and implications for DCC	Dec-19	
Explore billing changes	Continued liaison with National Grid Gas Transmission, Xoserve and Smart DCC to identify impacts on energy attribution, transportation billing processes and the provision of daily CV data for downstream billing under an FBM regime	Mar-18 – Dec-19	
Codes and Regulations	Required changes to codes and regulations will be mapped out at high level as part of the FBM Project output (note that detailed specification is outside Innovation remit)	Dec-19	
Second Industry Engagement & Project Close			Inform final Project CBA, report and recommendations to industry. Provide a full high-level assessment of the economic case to pursue implementation of FBM Option(s) Complete project output and share with industry and Ofgem for further action.
Industry Engagement 2	Discuss findings with stakeholders across the gas chain to inform CBA and final report.	Nov-19 – Mar-20	
Final project CBA	Update Initial CBA from project findings and industry dialogue. Review project implementation costs and benefits.	Mar-20	
Final Project Report and Industry Recommendation	Complete project report, assessing outputs against original objectives and highlighting learning from field trials and industry liaison.	Mar-20	

Preparation for Field Trials

Field Trial Site Locations

All Gas Distribution Networks (GDNs) have computer models of their gas transmission and distribution networks that are validated against measured pressures and flows (where available) for operational and capital investment planning. The FBM Project looks at the application of these existing models for the development of a new methodology that would more closely align the billed CV with the actual CV of the gas supplied. The installation of sensors will provide data to provide additional validation support, to demonstrate that network modelling can be used to show the movement of different gases through the network.

The field trials will involve installation of sensor equipment at a total of 55 sites in the East of England, as follows:

- 36 governor stations with biomethane tracking, pressure and flow measurement (where practicable) split between Chittering and Hibaldstow
- 4 governor stations with biomethane tracking, pressure, flow (where practicable) and calorific value measurement split between Chittering and Hibaldstow
- 15 street level installations with biomethane tracking and pressure measurement at Chittering

The sensors to be installed comprise:

- Oxygen to track biomethane from Chittering and Hibaldstow
- Pressure and governor regulator position to give an indication of flow
- Calorific value (at 4 selected governor stations) for the smart meter trials

Field Trial Measurements

Oxygen - Measurement of oxygen levels is critical, as the higher oxygen levels permitted for biomethane, under an HSE exemption, will be the means to identify the penetration of biomethane across each network under varying system conditions.

Pressure / Flow – Measuring inlet and outlet pressures at governors and mains pressure at street locations will provide key information on network dynamics, to support the modelling of CV zone behaviour.

Calorific Value – Calorific value will be measured at four selected sites for transmission to smart meters in support of the smart metering trial. The sites have been selected to provide additional validation information to the network models. CV will be measured by the GasPT which is an approved device for measuring CV under Ofgem Direction at biomethane network entry points.

Data Communications – The measurements will be transmitted at a suitable frequency to the DNV GL secure data cloud using GPRS mobile communications.

Measurement Site Selection

Chittering

A final selection of 17 governor stations and 15 street sites was drawn up which optimised the position on the network for understanding the zones of influence and the practicality of installing

the equipment. Sites which satisfied certain criteria such as pipe diameter and pipe material were prioritised as well as sites that are on public rather than private land. Figure shows the measurement locations for Chittering.

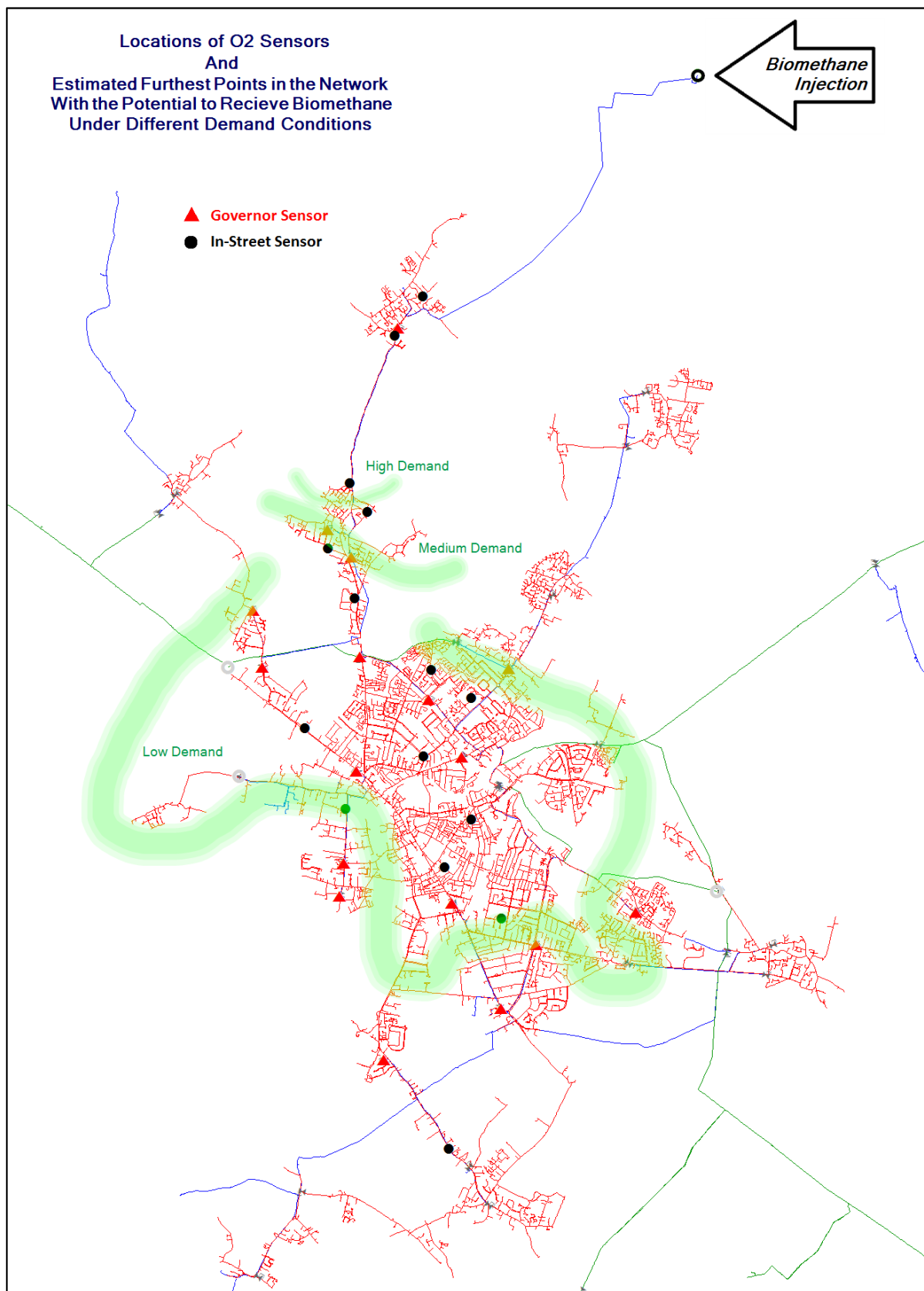


Figure 2-2: Location of measurement sites in Cambridge for Chittering biomethane entry point

Hibaldstow

A final selection of 23 governor stations was drawn up which optimised the position on the network for understanding the zones of influence and the practicality of installing the equipment. Sites which satisfied certain criteria such as high flow rates were prioritised. Figure below identifies the selected locations for Hibaldstow.

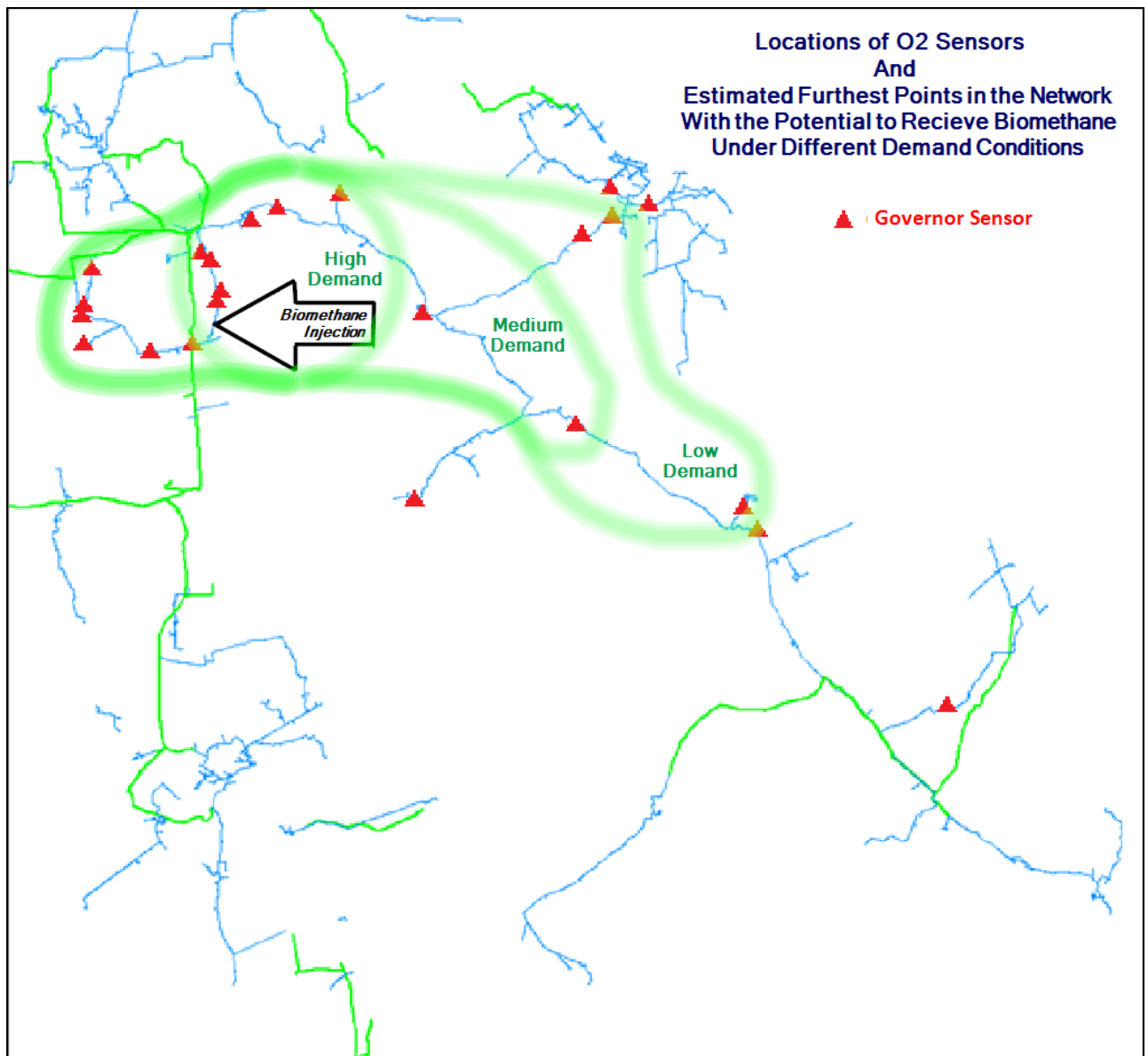


Figure 2-3: Location of measurement sites around Hibaldstow biomethane entry point

Details of design packs for the governor and street level sensor installations are provided in the FBM Stage Gate Report, which is available at www.futurebillingmethodology.com.

Model designs for both the governor and street level installations have undergone detailed review and iterative improvements to the initial model designs to ensure reliability and security of the installations; also to minimise visual impact and support detailed planning for the Streetworks element of the roadside installations. This detailed review has extended the design phase of the project and so timing within the construction phase is being revisited to maintain the delivery completion target in early September 2018. The design and locations for the street level installations are being shared with the relevant highway and planning authorities.

Smart Metering Trial

DNV GL is presently preparing detailed terms of reference for the Smart Metering trial to support development of the Ideal Option, which will draw CV data from the main field trial. The aim is to prove that a CV measured local to the consumer can be transmitted to a smart meter resulting in the consumer being billed on actual gas energy use rather than the volume of metered gas at a daily fixed CV. The smart metering Implementation Programme (SMIP) is independently deploying smart meters and the communications infrastructure which gives retail gas energy suppliers the ability to provide consumers with accurate gas energy usage information.

The new generation of smart gas meters support the calculation of thermal energy density of imported fuel using a calorific value (CV) and, if available, gas pressure, temperature and compressibility (PTZ) conversion constants. These devices are designed to be compliant with requirements of the programme's smart metering Equipment Technical Specifications (SMETS) and interoperable with the systems of the government's licensed communications infrastructure operator, the Smart Data Communications Company (Smart DCC).

A fully functioning smart meter System will be established at the DNV GL Technical Assurance Laboratory (DTAL) facility in Peterborough 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 of implementing the link between smart meters and the billing system.

3 Business Case Update

As part of Ofgem's January 2017 Project Direction, Cadent was asked to provide an initial Cost-Benefit Analysis (CBA) of the three project options (noting that this would be finalised as part of Phase 2) to demonstrate that, following industry engagement, there remained a strong case to proceed with the Future Billing Methodology Project.

This initial Project CBA built upon the original NIC Project Submission to:

- Take account of potential implementation costs for each of the three FBM options; Pragmatic, Composite and Ideal;
- Take fuller account of the cost of propanation of low CV gases such as biomethane;
- Monetise the carbon saving from the removal of propanation under FBM, and
- Monetise the carbon saving achievable from the expanded deployment of renewable and low carbon gases that we believe to be achievable by 2050 under FBM.

The Net Present Value (NPV) for each option was calculated under each of the National Grid's 2017 Future Energy Scenarios (FES). Summary tables from the *Two Degrees* and the *Slow Progression* 2017 FES result are shown in Table 3-1 and Table 3-2 below. The results are also NPV positive and robust when calculated against the other two 2017 FES, *Steady State*, and *Consumer Power*.

The methodology used for the initial Project CBA is provided in the FBM Stage Gate Report, which is available at www.futurebillingmethodology.com.

Table 3-1: Summary Table for the Cost Benefit Analysis for the 2017 Future Energy Scenario *Two Degrees*

FES:	2017 Two Degrees	FBM:	PRAGMATIC			COMPOSITE			IDEAL		
Cumulative NPV to end of year		Units	2030	2040	2050	2030	2040	2050	2030	2040	2050
NPV costs	Project	£m	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
	Implementation	£m	35.1	36.0	36.7	298.1	313.0	324.2	623.0	686.0	733.3
	Costs Total	£m	40.6	41.5	42.2	303.5	318.5	329.7	628.5	691.5	738.8
NPV benefits	Removal of propanation requirement	£m	271.9	941.3	1,712.3	241.8	911.2	1,682.2	170.6	840.0	1,611.0
	Carbon – propane removal	£m	54.2	330.7	837.1	50.6	327.2	833.6	39.6	316.1	822.5
	Carbon - FBM- Facilitated growth of renewable gas	£m	362.4	2,725.7	7,910.2	290.7	2,552.1	7,699.0	158.1	2,190.3	7,252.7
	Benefits Total	£m	688.5	3,997.7	10,459.6	583.2	3,790.5	10,214.9	368.3	3,346.4	9,686.2
Net NPV		£m	647.9	3,956.2	10,417.5	279.6	3,472.1	9,885.2	-260.1	2,655.0	8,947.5

Table 3-2: Summary Table for the Cost Benefit Analysis for the 2017 Future Energy Scenario *Slow Progression*

FES	2017 Slow Progression	FBM:	PRAGMATIC			COMPOSITE			IDEAL		
Cumulative NPV to end of year		Units	2030	2040	2050	2030	2040	2050	2030	2040	2050
NPV costs	Project	£m	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
	Implementation	£m	35.1	36.0	36.7	298.1	313.0	324.2	623.0	686.0	733.3
	Costs Total	£m	40.6	41.5	42.2	303.5	318.5	329.7	628.5	691.5	738.8
NPV benefits	Removal of propanation requirement	£m	157.1	514.3	916.7	138.7	495.9	898.3	96.7	454.0	856.4
	Carbon – propane removal	£m	31.1	178.3	442.6	28.9	176.2	440.4	22.4	169.7	433.9
	Carbon - FBM- Facilitated growth of renewable gas	£m	188.4	1,417.4	4,113.4	151.2	1,327.1	4,003.6	82.2	1,139.0	3,771.5
	Benefits Total	£m	376.6	2,110.0	5,472.6	318.8	1,999.2	5,342.3	201.4	1,762.6	5,061.7
Net NPV		£m	336.0	2,068.5	5,430.4	15.2	1,680.7	5,012.6	-427.1	1,071.1	4,323.0

4 Progress against Plan

Since the successful outcome of the Project Stage Gate in September 2017, the Future Billing Methodology project team has been focusing on two areas in particular, as follows:

Model design for field trial installations

The initial model designs produced in preparation for the project field trials have undergone detailed review to ensure optimised performance, improve security, and to minimise both the occupied space and visual impact on the local community. These factors are of particular concern as the robustness, security and reliability of the measurement installations with minimum intervention is critical to the integrity and success of the project. In addition, the visual impact and occupation of space – even where already compliant with planning regulations as permitted development – is critical to the smooth implementation and completion of the field trial, and to the reputation of the organisations involved. This detailed review has extended the design phase of the project and so timing within the construction phase is being revisited to maintain the project-critical delivery completion in early September 2018.

Continued industry engagement in Phase 2

The clear support for the Future Billing Methodology project evidenced by the project consultation was understandably tempered with concerns that a holistic approach should be applied in assessing the costs and benefits of potential future implementation of any FBM option. Also that the impact on Shipper / Supplier billing should be understood and the impact on customers should be minimised.

To this end, the second phase of industry engagement for the FBM Project has focussed on continuing dialogue with Xoserve and National Grid's Gas Transmission team to gain a clearer understanding of the potential impact that each FBM Option would have on the transportation billing process and the provision of CV information to support downstream billing. A report on these findings will be submitted to Ofgem on 31st March 2018, in fulfilment of SDRC 9.1b (see Section 7 of this report) and will be published on the FBM Project web site.

5 Progress against Budget

Table 5-1 reports the position against the project budget to the end of Period 8 in 2017-18. The budget has been re-phased to take account of the project Stage Gate and the consequent move of the installation phase into 2018 calendar year.

- DNV GL Costs in line with fixed payment schedule for project
- Underspend of £45,798 on internal costs due partly to timing of charge for web site maintenance and avoidance of a full Xoserve RoM in phase 1 of the project for billing implementation impacts.

Table 5-1: Actual costs v budget to P8 2017 and v total project budget

	PROJECT TO DATE			TOTAL PROJECT		
	ACTUAL	BUDGET	VARIANCE	ACTUAL	BUDGET	VARIANCE
LABOUR	691,931	700,652	8,721	691,931	2,402,076	1,710,145
CONTRACTORS / EQUIPMENT	1,239,582	1,256,034	16,452	1,239,582	2,680,448	1,440,866
IT	-	20,625	20,625	-	62,801	62,801
IPR COSTS	-	-	-	-	-	-
TRAVEL AND EXPENSES	1,300	1,300	-	1,300	28,500	27,200
CONTINGENCY	-	-	-	-	-	-
DECOMMISSIONING	-	-	-	-	206,976	206,976
TOTALS	1,932,813	1,978,611	45,798	1,932,813	5,380,801	3,447,988

6 Project Bank Account

Bank statements have been provided to Ofgem. Due to the confidential nature of the project bank statements, they have not been included in this report.

7 Successful Delivery Reward Criteria

This section sets out the project Successful Delivery Reward Criteria (SDRC), each under a subsection labelled 9.1 to 9.5. The SDRC are actions linked to outputs of the project with a realistic but challenging deadline. The following subsections set out each criterion and clearly state the evidence that it is proposed Ofgem should use to assess performance against criterion. Note all SDRC delivery dates refer to the end of the calendar month.

Completed / Current SDRCs

9.1a. Industry Engagement – Phase 1 (Completed)

The Industry Engagement Phase 1 was undertaken as part of Work Pack 1a and the Stage Gate Report provided Ofgem with evidence of the following:

- The Terms of Reference for the Industry Engagement
- The numbers and types of participants in the Industry Engagement
- A compilation of the output from workshops, questionnaires and meetings held during the Industry Engagement (Phase 1)
- Initial cost benefit analysis
- Requirement for the validation of the network modelling

This Stage Gate Report was delivered to Ofgem by Cadent on 10 August 2017, in line with the terms of Section 3 of the Project Direction. Delivery of this report constitutes fulfilment of SDRC 9.1a.

9.1b Industry Engagement – Phase 2

The Industry Engagement Phase 2 will take place in Work Pack 1b and this SDRC will provide Ofgem with evidence of the following:

- Phase 2 industry engagement report to include an update on continuing industry liaison following Phase 1

As mentioned in Section 4 above, the second phase of industry engagement for the FBM Project is focussed on continuing dialogue with Xoserve and National Grid's Gas Transmission team to gain a clearer understanding of the potential impact that each FBM Option would have on the transportation billing process and the provision of CV information to support downstream billing. A report on these findings will be submitted to Ofgem on 31st March 2018, in fulfilment of SDRC 9.1b (see Section 7 of this report) and will be published on the FBM Project web site.

Future SDRCs

9.2. Novel tracking of unconventional gases by measurement

The novel tracking of unconventional gases by measurement will involve the installation and collation of field trial measurements. This SDRC will provide Ofgem with evidence of:

- The installation of additional sensors on the gas network in governor stations and at street level
- The efficacy of measuring oxygen content, pressure and flow to support the validation of network modelling for determining the distribution of biomethane in LP and MP networks

This SDRC will be based on milestone 12 and will be delivered to Ofgem by Cadent on 31 December 2019.

9.3. Report on novel validation of network modelling for embedded and network charging areas

The novel validation of network modelling for embedded and network charging areas will use zonal analysis of pressure, flow and oxygen tracking measurements from the field trials. This SDRC will provide Ofgem with evidence of:

- How to analyse oxygen, pressure and flow data from the field trials using network modelling techniques
- Options and methods for assigning CV to charging areas for the *Pragmatic* and *Composite* scenarios

This SDRC will be based on milestone 13 and is planned to be delivered to Ofgem on 31 December 2019.

9.4. Report on Smart Metering Laboratory Trials

The smart metering laboratory trials will be carried out at the DNV GL Technical Assurance Laboratories in Peterborough. Several CV measurement devices will be installed in the network field trial which would transfer CV to the smart meters. This SDRC will provide Ofgem with evidence of:

- The transfer of CV to smart meters via a mimic of DCC
- Options and further developments required for the future transmission of CV from smart meters to the billing process

This SDRC will be based on milestone 11 and will be delivered by Cadent to Ofgem in 31 December 2019.

9.5. Future Billing Methodology Recommendation

The Project will report on Future Billing Methodologies and cost benefits of the three scenarios *Pragmatic*, *Composite* and *Ideal* concluding with a recommendation and high level implementation plan. This SDRC will provide Ofgem with evidence of:

- The Project findings through a collation of the outputs from Work Packs 1 to 4
- The Project recommendations and how these were derived including cost benefit analyses
- High-level implementation plan of the recommendations

This SDRC will be based on milestone 15 and will be delivered by Cadent to Ofgem on 31 March 2020.

8 Data Access Details

All project information, including project submissions, reports, project findings and analysis has and will be published on the FBM Project web site, which can be accessed using the following link:
www.futurebillingmethodology.com

The web site has an RSS facility that has been taken up by over 160 individual stakeholders and as we progress with the project, we are seeking opportunities to widen the web site readership, especially among key stakeholders who would be directly impacted by implementation of FBM. The web site is maintained annually and updated at each reporting stage.

However, we will also be utilising a range of existing industry channels such as the UNC Workstreams, ENA and IGE to actively share project findings.

9 Learning Outcomes

The central learning expected to arise from this NIC project will be delivered during and following the field trial measurement phase. However, we believe that a number of important learning points have already emerged as a result of the industry engagement and field trial preparation work so far, as follows:

Appetite for change

It is clear that the industry does have an appetite to explore alternative approaches to the current LDZ FWACV methodology, as this is seen as a potentially significant barrier to realising the full carbon benefit achievable from maximising the deployment of renewable and other low carbon gases such as hydrogen / natural gas blend across the existing gas distribution networks.

The onus is now on successful delivery of the field trial and further industry engagement to inform the final project CBA, which will indicate whether an FBM solution could facilitate the decarbonisation of heat in a cost-effective way.

Early indications from the initial Project CBA suggest that broadly one third of domestic demand could be met by renewable gas sources by 2050. Potential future developments such as reclassifying “black-bag” waste to redirect this from landfill to renewable feedstock for the production of BioSNG could further boost the decarbonisation of heat using the existing gas grid.

Customer choice is now recognised as one of the most significant factors that will determine the path to decarbonising heat in the UK. Facilitating an ever-expanding role for renewable gases in fuelling heat demand aligns with the current preference for over 80 per cent of customers.

To the extent that heat can be decarbonised using the existing gas grid by 2050, the cost and disruption associated with replicating its significant heat-delivery capabilities can be avoided and hence bring about a lower impact transition to meeting the overarching emissions target.

Holistic approach required

Feedback from the project consultation emphasised that, in order to determine the true net value of any future FBM solution to attributing gas energy in billing, the assessment must apply a holistic approach. This informed the initial CBA methodology and this will be further developed for the final project CBA using a consistent modelling framework.

Effective engagement with stakeholders

Through our experience gained in the first phase of the project, we have learned the value of using existing regular industry forums for communication of project findings and to generate debate on potential changes. In particular, the regular UNC Workstream meetings for gas distribution and gas transmission, facilitated by the Joint Office of Gas Transporters, provide an effective way of communicating with other gas transporters, shippers and suppliers; whereas industry forums under IGEM and ENA provide a wider stakeholder catchment. We will be using these channels, in addition to the FBM Project web site to disseminate project findings.

10 Intellectual Property Revenue

The Project team will comply with the default IPR Provisions. The purpose of the Project is to generate a new billing methodology. Since there must necessarily be a common billing regime across the country there is no intention or opportunity to exploit arising IPR commercially in GB. Copyright will exist on the reports produced as part of this work, but they will be published in the public domain where required for effective knowledge dissemination.

Background IPR, such as that within equipment supplied for the purposes of executing the project (e.g. oxygen sensors) will remain owned by the suppliers as Commercial Products. This will include DNV GL's background IPR in the network modelling tools Synergi Gas, GBNA and Graphical Falcon. These tools are already licenced and used by the GDNs to underpin their network planning and operational analysis. The modelling and analysis work carried out in the Project is to develop the understanding of CV changes and affected zones and will be delivered on the software versions currently available. No additional software capability will be developed as part of the Project. Any modelling procedures that are developed as part of the final recommendation will be software agnostic to allow ready implementation by any gas network operator.

11 Risk Management

In preparation for the installation phase of the project field trial, DNV GL have carried out a Quantative Risk Analysis for this work, which is presently being reviewed by Cadent.

With regard to general project risks, the more detailed challenge and review of installation designs to improve security and reduce visual impact, particularly for the street level measurement sites planned for installation at fifteen locations across the LP mains network in Cambridgeshire, has necessitated some amendment to the installation phase plan.

The project team is considering alternative options for supplying power to the instrumentation and communications modules, one of which would involve an unmetered connection to the local electricity network. Cadent are presently exploring the process of obtaining such connections to identify both the cost implications and the potential further impact on scheduling of installation works.

The critical requirement is that all measurement points are installed, tested and fully commissioned by early September 2018, to ensure the full 12-month measurement exercise can be completed in time to support the timely delivery of the final phase of the project. Whilst the project team will strive to avoid delays, any threat to timely project delivery will be communicated to Ofgem.

12 Accuracy Assurance Statement

This report has been prepared in accordance with the Gas Network Innovation Competition Governance Document published by Ofgem. The project has been subject to review and challenge by the Cadent Project Manager and signed off by Richard Court, Head of Regulation and External Affairs, who is Project Sponsor for this NIC project.

Richard Court has confirmed that the processes in place and steps taken to prepare this Project Progress Report are sufficiently robust, and that the information provided is accurate and complete.

13 Glossary of Terms

Term	Meaning
CBA	Cost-Benefit Analysis
CV	Calorific Value – expressed in mega Joules per cubic metre of gas (MJ/m ³) at standard temperature and pressure
DNV GL	Project partner of Cadent
FBM	Future Billing Methodology
FES	Future Energy Scenario (National Grid publication)
FWACV	Flow Weighted Average Calorific Value
GB	Great Britain
G(CoTE)R	Gas (Calculation of Thermal Energy) Regulations – govern calculation of gas CV for billing
GDN	Gas Distribution Network
GRP	Glass-Reinforced Plastic
GS(M)R	Gas Safety (Management) Regulations – governs the safety of the GB gas supply
LDZ	Local Distribution Zone (gas distribution networks in GB comprise 13 LDZs)
NIC	Network Innovation Competition
NPV	Net Present Value
OAD	Offtake Arrangements Document
RIIO	Ofgem regulatory framework: Revenue = Incentives + Innovation + Outputs
SDRC	Successful Delivery Reward Criteria
UNC	Uniform Network Code

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