Future Billing Methodology

NIC04 – Project Progress Report 2 December 2018

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1 Executive Summary

The Future Billing Methodology (FBM) NIC Project commenced in April 2017 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.

Phase 1 of the project, comprising the initial industry engagement and CBA, was successfully completed in September 2017, with Ofgem's approval that the project could progress to the field trials and onwards to conclusion. Phase 1 also included the production of high level generic model designs for sensor installations at governor stations and new temporary roadside kiosks in the East of England.

The initial 6 months of Phase 2 of the project involved continued liaison with Xoserve and National Grid's Gas Transmission team, to gain initial views on the potential impacts which the implementation of a Future Billing Methodology regime could be expected to have on gas transportation billing and the provision of CV information for downstream billing. A report on our initial findings was submitted to Ofgem on 28th March 2018[1].

The main body of work in Phase 2 of the project to date has focused on the following:

- Development of detailed technical designs for the measurement installations;
- Procurement, build and testing of components;
- Detailed stakeholder engagement planning and preparatory work to support the installation of the temporary street kiosk sites around Cambridge;
- DNV GL set up of the Smart Meter test laboratory in readiness for the field trial.

The changes to design have required a comprehensive site review and iterative improvements both to the technical model and site-specific designs to ensure reliability and security of the installations, and to support detailed planning for the Streetworks element of the roadside kiosk installations.

The development of designs has had to overcome a complex range of challenges driven, initially, by the need to switch from the original photo-voltaic (PV) power source to using unmetered power connections from the local electricity Distribution Network Operator (DNO). This work has significantly extended the design phase of the project and has required a dynamic review of delivery planning.

[1] SDRC 9.1b Report on 2nd Phase of Industry Engagement 28th March 2018: https://futurebillingmethodology.com/wp-content/uploads/2018/04/SDRC-9-1b-Report-Final.pdf

Latterly, factory testing of the oxygen sensor has revealed performance issues when attempting to detect oxygen at the levels we would expect to encounter in the network. We are thoroughly retesting these devices and have sourced alternatives which will be tested in parallel with the existing units. We hope to complete our evaluation during December 2018.

The project-critical requirements are that:

a) Field trial measurement points provide sufficient network coverage to validate our planning models and
b) Installations are completed, tested and fully commissioned to ensure a full 12-month measurement exercise can be completed, thus taking account of a full seasonal transition.

As a result of the above, Cadent has advised Ofgem that the remaining SDRCs (9.2-9.5) and the project end point will now be delayed by 12 months. A more detailed explanation of the contributory factors follows in the body of this report.

2 Project Manager's Report

Introduction

The Future Billing NIC Project is being undertaken by Cadent, working in partnership with DNV GL. It 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. The FBM 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.

FBM Project Phase 1

Details of the Future Billing Methodology Project structure and information on Phase 1 of the Project are provided in the first annual Project Progress Report, released in December 2017[2].

FBM Project Phase 2

Ofgem's Project Direction allowed up to £250k funding ahead of the Phase 1 Stage Gate to support the initial CBA and preparatory work for the field trial. Cadent's Stage Gate submission in Aug-17 therefore included preliminary model designs for the field trial installations. However, detailed design work following Stage Gate approval began to identify a number of issues. Cadent's first PPR in Dec-17 reflected this and indicated an extension to the design phase of the project and re-phasing of the construction plan to maintain the planned September 2018 delivery target.

Since that time, the project team has been working through a range of complex, interacting, site-specific issues which have resulted in a significant extension to the design phase. This has also forced an optimisation of the of field trial site population. The issues are summarised as follows:

Electric Power Source

Detailed design work to assess the power requirements throughout the UK winter period revealed that PV panels would need to be significantly larger than originally assessed. Supporting larger PV panels would require expensive civil works. Larger PVs would also present visual impact and site security issues. Full evaluation determined that the principal source of power should be changed to an unmetered DNO low voltage supply. Quotations were obtained from the relevant DNOs and assessed for cost / feasibility. On receipt of the DNO quotations, a site-by-site review identified a number of governor sites for deselection, due to very high quoted costs for complex or remote DNO connections.

[2] NIC04 – Project Progress Report 1 December 2017: https://futurebillingmethodology.com/wp-content/uploads/2017/12/FBM-Project-Progress-Report-Final-v2.pdf

Land Access

Whilst not an issue for the temporary roadside kiosks located alongside the public highway, the need to run DNO power lines into existing governor installations necessitated a site-specific assessment of land access rights. Searches by Cadent identified that nearly 40% of the proposed FBM governor sites had third-party land ownership on or around the governor site and/or proposed DNO cable route.

Further investigation revealed that, due to the way in which the gas network has evolved over time, each of the affected gas district governors has site-specific legal arrangements, each of which would need individual renegotiation with land owners to support DNO cable access. Cadent assessed that this would introduce significant legal costs and would effectively remove control over DNO connection delivery times.

Battery Power Option

An alternative, battery-power option is under development, in order to retain a targeted number of governor sites affected by land issues. As the provision of battery power relies on a regular battery replacement programme throughout the measurement period, the number of governor sites recovered via this option had to be limited to remain within budget.

Hazardous Area Assessment

For each of the FBM installations, it is essential that electrical power and communication elements are located clear of any spark-ignition risk. For new street kiosks, this can be designed-in, but designing the retrofit for existing governors can be complex. Detailed design site surveys revealed that each governor kiosk is in fact unique. A programme of site-specific Hazardous Area Assessments (HAA) was required to identify where electrical and communication elements could be safely installed around each governor kiosk. These HAAs also identified where the FBM installation would necessitate adjustments to the governor venting configuration and other site adjustments. A programme of works has been undertaken by Cadent Operations to deliver this.

Earthing of Installations

In addition to the above, electrical installations at gas sites must be isolated from any residual current risk from the DNO cable earth. It was identified that existing electrical design policy for gas installations had been developed principally to support high-pressure Gas Transmission sites. A proportionate and cost-effective approach to safe supply isolation had to be developed for the FBM Project installations and a formal policy deviation authorised.

Other Physical Site Factors

For the FBM governor sites, a range of other site-specific factors needed to be taken into account. Some of the brick-built governors are known to contain asbestos, which must not be disturbed during installation works. Detailed surveys were undertaken at these sites by specialists to identify where asbestos-containing materials (ACM) were located, its condition and what remedial works

might be necessary to ensure that the FBM installation could be undertaken safely. The costs associated with ACM-related works will be excluded from the project. Other governor sites have atypical layouts, such as compact kiosks, or an existing electrical supply, which require bespoke detailed design work.

Detailed Iterative Site Review

To ensure that project outputs can be maintained and that the project remains deliverable within the original budget and to reasonable timescales, all of the above design/site-difficulty/cost factors were analysed together in a comprehensive and iterative site review. This was managed in conjunction with DNV GL's Digital Solutions team to ensure that network coverage of sites could continue to deliver robust project outputs. A comparison of the initial and final field trial site population is provided in Table 2-1.

RESULTS OF FBM SITE OPTIMISATION	ORIGINAL	LATEST
East Anglia - Temporary Street Kiosks	15	13
East Anglia - Governors	17	9
East Anglia - Total Sites	**32**	**22**
East Midlands - Governors	**23**	**14**
FBM Total	**55**	**36**

Table 2-1: Results of the iterative field trial site review

DNV GL's Digital Solutions team has confirmed that the remaining site population provides sufficient network coverage to enable robust analysis of the penetration of biomethane from the specified field trial source across the local gas network under varying demand conditions, and so will not adversely impact the final project outputs. However, it is important that the project can capture a full 12 months' data in order to cover the full annual range of demand conditions. The revised site population will retain CV measurement at 4 sites, using GasPT devices, to inform the Smart Metering Trial in Work Pack 3 of the Project.

Graphical network representations of the FBM field trial sites influenced by Chittering in East Anglia LDZ and Hibaldstow in East Midlands LDZ are provided on a pre- and post-site review basis in Appendices 1-4 below.

Testing Issues and Project Extension

Having worked through the challenges described above, installation designs were largely complete by late September 2018, and alternative power options were being considered to enable retention of a proportion of governor sites with land ownership issues, to ensure sufficient network coverage to maintain the integrity of project outputs. Procurement of instruments and materials had been deferred while design issues were being resolved, to avoid risk of cost stranding, but was now substantially complete.

At this stage, commencement of installations was targeted for November 2018, for completion in March 2019. However, dynamic planning indicated a very high compression of activities at the end of the project term in order to complete the measurement programme and the other key outputs.

Pre-Factory Acceptance Testing of components began in October and raised a number of issues with key components. This made it clear that a Project extension would be required to allow a full 12 months measurement window and provide sufficient time for CV zone analysis, the final project CBA and the final industry engagement on findings and recommendations.

Sensor Issues

Factory testing initially identified a faulty batch of pressure sensors, which were replaced. However, initial testing of the central component – the Systec Mk II oxygen sensor – identified performance issues when attempting to detect oxygen at the levels we would expect to encounter in the network.

Cadent's SCADA systems data, sourced from Gas Chromatographs at each of the two target biomethane entry sites, had indicated typical oxygen levels in biomethane injected at Hibaldstow and Chittering in the range 0.1% - 0.2 % molar. This is much higher than in natural gas, for which NTS entry agreements stipulate a maximum of 0.001% molar. However, this is at the extreme low end of the range monitored by the Systec devices for GS(M)R compliance purposes, to administer the 1% threshold cut-off allowed by the HSE exemption for biomethane. The innovative application of the oxygen sensor has highlighted the issue of reduced accuracy at lower oxygen levels for the Systec Mk II device.

Further testing was undertaken which confirmed initial test indications. Since that time our supplier has been researching the market to find an alternative device which will perform reliably in the lower ranges. We have sourced alternatives which will be tested in parallel with the existing units and hope to complete our evaluation during December 2018.

Project Extension and Revision to Plan

Alongside testing, we are maintaining our installation plans under dynamic review. We currently expect to be able to complete installation in summer 2019. A 12-month extension would allow some degree of contingency, whilst ensuring that the project can be delivered in a reasonable time-frame.

Smart Metering Trial

DNV GL has now set up the test facilities in the laboratory and has sourced smart meters in readiness for the Smart Metering trial. This will 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 supports 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).

The fully functioning smart meter System being established at the DNV GL Technical Assurance Laboratory (DTAL) facility in Peterborough will work alongside the main project field trial 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)
- Liaise with industry stakeholders to estimate the costs of implementing the link between smart meters and the billing system

3 Business Case Update

The first annual Project Progress Report in December 2017 provided details of the initial Cost Benefit Analysis undertaken as part of Phase 1 of the FBM Project. At this time, we have no further update on the business case for this project.

Details of the methodology used for the initial Project CBA and the summary results are provided in the FBM Stage Gate Report, which is available at www.futurebillingmethodology.com.

The Project CBA will be fully updated for the final Project Report, to be submitted under SDRC 9.5.

4 Progress against Plan

The issues described in Section 2 of this report have significantly impeded progress against the project plan. However, progress has been made in a number of areas, as follows:

- **Second Phase of Industry Engagement SDRC 9.1b –** The second phase of our industry engagement was completed and aimed to gain initial thoughts on systems and process implications of implementing a Future Billing Methodology Regime. The report on this engagement was provided to Ofgem on 28th March 2018.
- **Installation Design Packs –** Model and site-specific technical design packs for the temporary street kiosks and governor measurement installations are now largely complete, pending resolution to the current sensor testing.
- **Procurement –** Procurement of instrumentation, associated components and other materials has been completed, but further actions will be required urgently, should it be necessary to change to an alternative oxygen sensor from another manufacturer.
- **Build –** Factory build of the temporary roadside kiosks for installation in EA LDZ has been completed and is being used for the current sensor testing. However, this will require adjustment, should a sensor from another manufacturer be used.
- **Factory Acceptance Testing –** Has commenced, but is on hold pending resolution of sensor issue.
- **Stakeholder Engagement –** Plans are in place to support the street installations around Cambridgeshire. Initial letters have been issued to stakeholders including affected residents, schools, parish councils, etc. Face-to-face contact has been undertaken, where required, to explain the project. Further, more detailed information on the stakeholder experience is ready to be dispatched ahead of installation. Stakeholder management arrangements are in place within Cadent to respond to any concerns around the installations.
- **Smart Meter Trial –** DNV GL has now set up its laboratory test facility, as described in Section 2.

5 Progress against Budget

Table 5-1 reports the position against the project budget to the end of Period 7 in 2018-19.

	PROJECT TO DATE			TOTAL PROJECT		
	ACTUAL	BUDGET	VARIANCE	ACTUAL	BUDGET	REMAINDER
LABOUR	1,838,751	1,871,318	32,567	1,838,751	2,402,076	563,325
CONTRACTORS / EQUIPMENT	2,541,337	2,553,637	12,300	2,541,337	2,680,448	139,111
IT	26,972	39,875	12,903	26,972	62,801	35,830
IPR COSTS	-	-	-	-	-	-
TRAVEL AND EXPENSES	4,642	4,642	-	4,642	28,500	23,858
CONTINGENCY	-	-	-	-	-	-
DECOMMISSIONING	-	-	-	-	206,976	206,976
TOTALS	4,411,702	4,469,472	57,770	4,411,702	5,380,801	969,100

Table 5-1: Actual costs v budget to P7 2018-19 and v total project budget

Commentary

- DNV GL Costs remain in line with fixed payment schedule agreed for project. However, as a result of the 12-month delay to the end of the Project, the remaining payments will be re-phased, with effect from November 2018 (see below).
- Underspend on Cadent internal costs due mainly to the delay in the field trail installations.
- The £12,903 underspend against the Project budget to date principally reflects lower-than-projected web site maintenance costs. This may be offset in future, in view of the project extension.

Project Extension – Payment Schedule

The fixed payment schedule agreed for the project has been profiled to underpin delivery of the field trial by the end of the first half of Year 2 of the project.

Cadent has worked very closely with its project partners, DNV GL and their contractor, Orbital throughout 2018. We have maintained the originally agreed payment schedule up to this point, to ensure timely procurement of components and materials, and to ensure that installation delivery could go ahead as soon as design approval and testing could be completed.

As at the end of October 2018 Cadent had paid just under £4.17m out of the total £4.75m DNV GL project delivery charge (just under 88%). In view of the 12-month Project extension, we will negotiate an appropriate re-profiling of the remaining payments, with retrospective effect from November 2018, to reflect the amended scheduling of activities during and after the field trial.

6 Project Bank Account

Arrangements are in hand to provide Ofgem with Project Bank statements, in line with Section 8.15 of the Gas Network Innovation Competition Governance Document. Due to the confidential nature of the project bank statements, they have not been included in this report.

7 Successful Delivery Reward Criteria

Table 7-1 below 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. All SDRC delivery dates refer to the end of the calendar month. The delivery dates for future SDRCs have been adjusted to reflect the 12-month Project extension.

Successful Delivery Reward Criterion	Evidence
9.1a. Industry Engagement – Phase 1 11 August 2017 **ACHIEVED**	The Industry Engagement Phase 1 will take place in Work Pack 1a and this SDRC will provide 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 SDRC will be based on milestone 9a of the Full Submission. Submit Phase 1 report to Ofgem in line with condition 2 set out in section 3 of this Project Direction. Do not proceed on to the remaining SDRC until Ofgem consent is given in line with condition 2.
9.1b. Industry Engagement – Phase 2 31 March 2018 **ACHIEVED**	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 This SDRC will be based on milestone 9b of the Full Submission.
9.2. Novel tracking of unconventional gases by measurement **31 December 2019** **DELAYED 12 MONTHS**	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 of the Full Submission.
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

31 December 2019 **DELAYED 12 MONTHS**	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 in the Full Submission.
9.4. Report on Smart Metering Laboratory Trials **31 December 2019** **DELAYED 12 MONTHS**	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 of the Full Submission.
9.5. Future Billing Methodology Recommendation **31 March 2020** **DELAYED 12 MONTHS**	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 of the Full Submission.

Table 7-1 Successful Delivery Reward Criteria reflecting amended delivery dates.

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 a web feed facility (RSS) 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 IGEM to actively share project findings.

9 Learning Outcomes

Section 9 of the December 2017 Project Progress Report focused on the learning points gained from the initial industry engagement in Phase 1 of the Future Billing Methodology Project. Since that time, further engagement was undertaken under SDRC 9.1b with Xoserve and National Grid's Gas Transmission team, as key delivery agencies in the gas billing process, to gather initial thoughts on the potential impacts of implementing a future CV zone based billing framework.

This section of the report focuses on the findings from that exercise, which are summarised below. The issues raised will inform further thinking as the Future Billing Methodology Project goes forward.

Xoserve

The indications from our initial liaison with Xoserve are that CV zone based gas transportation billing could be implemented with little or no impact on the format of gas transportation invoices. This is because the zonal CV value used in this process would only impact directly on the background calculations to the SMP-specific Settlement Invoice, and in the AQ review calculations. However, there are two key dependencies around this:

a) Creating and maintaining CV zones for billing
b) Alignment of energy attribution with downstream gas billing

Both the above elements imply potentially significant systems and process development work, but (b) lies outside the GDNs' remit.

National Grid Gas Transmission

Our engagement with National Grid's NTS team discussed the changes that would be required to the Offtake Arrangements Document (OAD) which supports the main contract for gas transportation, as this defines the charging areas to which the regulations governing energy attribution[3] apply.

The present OAD defines these charging areas for gas distribution as each of the 13 LDZs which comprise the GB gas distribution networks. The implementation of an FBM framework would require this document to recognise each CV zone as a charging area. Cadent recognised the potentially significant implications which a CV zone-based billing regime could have on the Energy Tracking function undertaken by National Grid.

From examining the Pragmatic Option, the NTS team identified a number of risks and issues, summarised here as:

a) Potential risk of additional CV shrinkage from any zonal misallocation or instability could require consideration of licensing and funding changes.

[3] The Gas (Calculation of Thermal Energy) Regulations, as amended 1997.

b) The more complex energy attribution regime could require more resources, potentially requiring a review of the split of roles and responsibilities between NTS and GDNs and the relevant funding.
c) Any change to regime and/or roles and responsibilities would require transitional arrangements to be defined, and arrangements would need to deal with "loss of record" events, etc.
d) An increasing number of charging areas based on CV zones would be likely to require upgrades to related systems, e.g. to GEMINI.
e) Could Supply Meter Points potentially swap between CV zones, e.g. between seasons, and how would the supporting systems cope?

Cadent acknowledges the input from Xoserve and National Grid Gas Transmission. It is worth noting here that one of the key aims of FBM is to minimise allocative distortions in the billing of gas energy and so the impact on CV shrinkage will be a major area of focus at the analytical stage of the field trial. We will seek to understand the potential impact of maintaining CV zone stability over time on CV shrinkage. Further detail on this area can be found in the SDRC 9.1b Report.[4]

We are hopeful that once measurements are under way we will begin to see a correlation between our empirical observations and modelled results from our network planning model. Once we have achieved an appropriate level of confidence in our observations, we will begin to share our findings.

We believe that this would be an appropriate point to recommit industry resources to looking further into potential implementation impacts and to begin estimating implementation costs at high level to help complete our final Project Cost Benefit Analysis. This will in turn inform our final recommendations to the industry.

[4] SDRC 9.1b Report on 2nd Phase of Industry Engagement 28th March 2018: https://futurebillingmethodology.com/wp-content/uploads/2018/04/SDRC-9-1b-Report-Final.pdf

10 Intellectual Property Rights

The Project team will comply with the default IPR Provisions. The purpose of the Project is to provide a proof-of-concept for 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

The current Project Risk Summary is provided below:

FBM Project - Summary of Key Risks		
Ref	**Risk description & impact**	**Risk Mitigation(s)**
1	Weather risk - Delays site installation works due to adverse weather conditions	1. Installation works now scheduled to commence Late February/March 2019 2. Contingency time within planned activities 3. Contingency period planned for each stage 4. Further contingency time proposed within overall plan
2	Unforeseen site issues/complications eg Residents' objections to proposed works - May result in delays to site installation works	Cadent have undertaken a targeted customer engagement campaign on FBM kiosks with local residents and the appropriate local authorities. Processes are in place to manage and respond to any concerns. Site teams will be briefed and equipped with Cadent contact details.
3	Cadent site resource availability - This is a dependency for all Governor sites. Especially in winter/high demand periods.	1. Detailed resource requirements issued to Cadent Operations to secure advance support. 2. Installation works currently scheduled to commence March 2019, subject to successful completion of sensor testing programme.
4	DNO UMS connections - Late delivery will delay commissioning.	1. Orders placed with suppliers and installation dates TBA with DNO under their service level agreement timescales. 2. Orbital managing DNO delivery.
5	1. O2 sensor - Risk sensitivity of unit is not able to differentiate between Biomethane and NTS Gas. 2. Risk of further project delays related to resolution of sensor issues.	1. Advanced testing of 2 optional sensors is being undertaken by Orbital to confirm suitability, with the most suitable sensor selection to be agreed between Cadent and DNV GL. 2. Manage and seek to minimise delays as part of sensor testing and selection.
6	This is an innovation project involving the development and validation of novel methodologies. There is a risk that the methodologies cannot be validated by the field trials, that the sensors may not operate or be fully suitable for the application, or that the modelling cannot be made to work satisfactorily. This would impact on project costs/timeline/completion of associated milestone and potentially affect the project benefits.	1. Ensure all stakeholders aware and set expectations as a "Proof of Concept". 2. Ensure reasonable steps taken in technical selection and testing of equipment prior to final acceptance. 3. Technical review and monitoring throughout the project.

7	Biomethane sites may not operate and perform as required and/or may not provide valid data for the purposes of the project and model (O2).	1. Ensure all stakeholders aware and set expectations. 2. Ensure reasonable steps taken in technical selection and testing of equipment prior to final acceptance. 3. Technical review and monitoring throughout the project.
8	Site and infrastructure condition/asbestos and location/access to pipelines. Project assumption is that the condition of Cadent assets is suitable for safe installation of proposed equipment. Risk if not suitable is significant delay and additional costs.	1. All sites have been selected and surveyed in detail. 2. Experienced industry-approved contractor undertaking street site works. 3. Detailed Construction Phase Plans and site specific RAMS to be issued and agreed ahead of works start.
9	Demand level variations. There is a risk that the weather variations within the trial LDZs and project time period may not provide sufficient high and low demand periods	Field trial covers two different networks. A 12 month schedule is planned for the field trial which also offers some contingency.
10	Delays to sensor installation schedule due to site land owner/third party issues/traffic management plan plus permissions/way leaves etc. Impact would be on project delivery timeline and potential cost implication.	1. Assess risks and review with sub-contractor/Cadent following the site surveys - Completed 2. Obtain early visibility of requirements - Completed 3. Effective and early engagement by Cadent with land owners, Highways Agency and Local Authority - Completed 4. Management review and monitoring throughout the project.
11	Governor Hazardous Area Assessment site adjustments - Completion ahead of planned Governor installations is a dependency.	Work programme nearing completion, monitored by Cadent PM.

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.

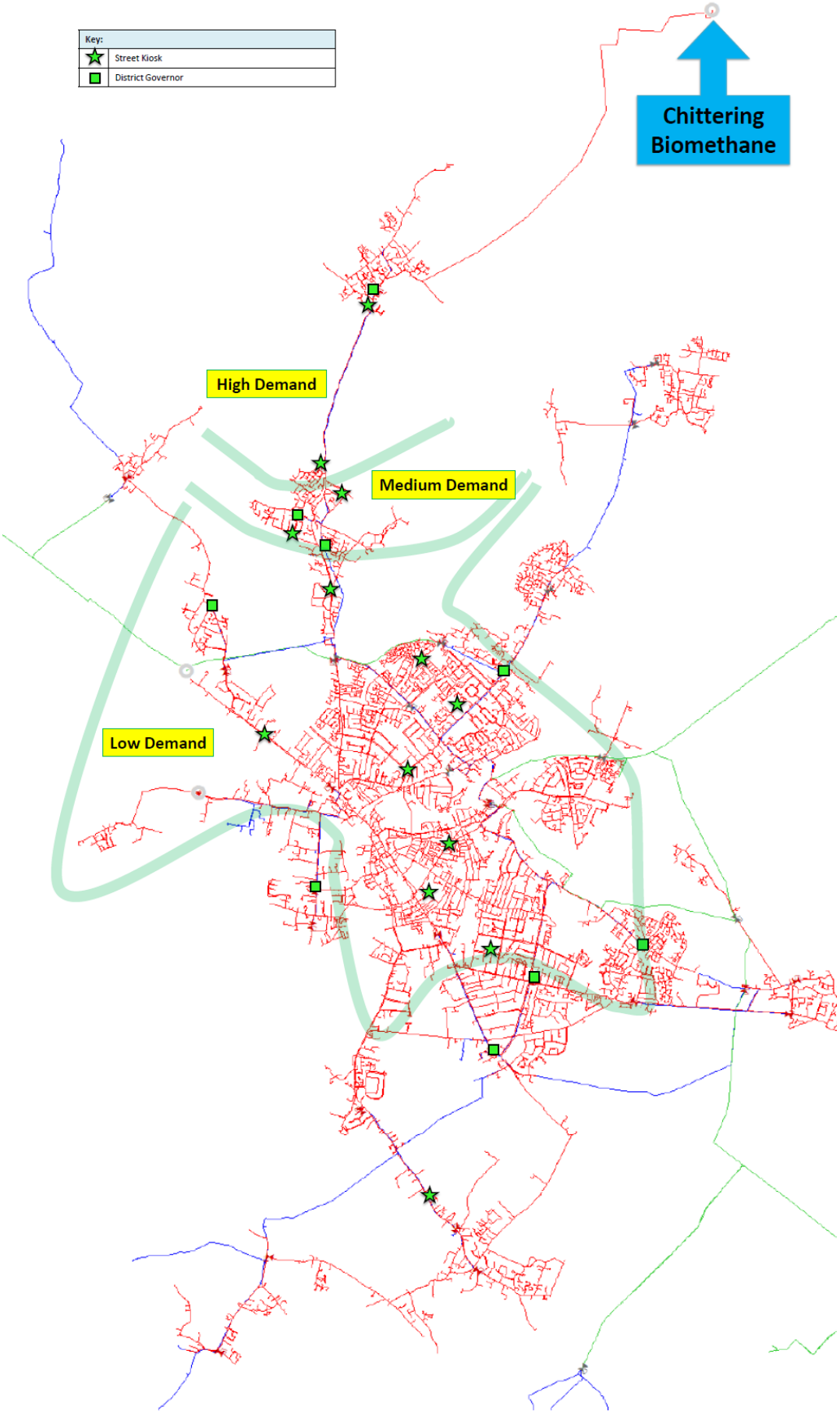
Richard Court has confirmed that the processes in place and steps taken to prepare this Project Progress Report are sufficiently robust, and that the information provided is accurate and complete.

13 Glossary of Terms

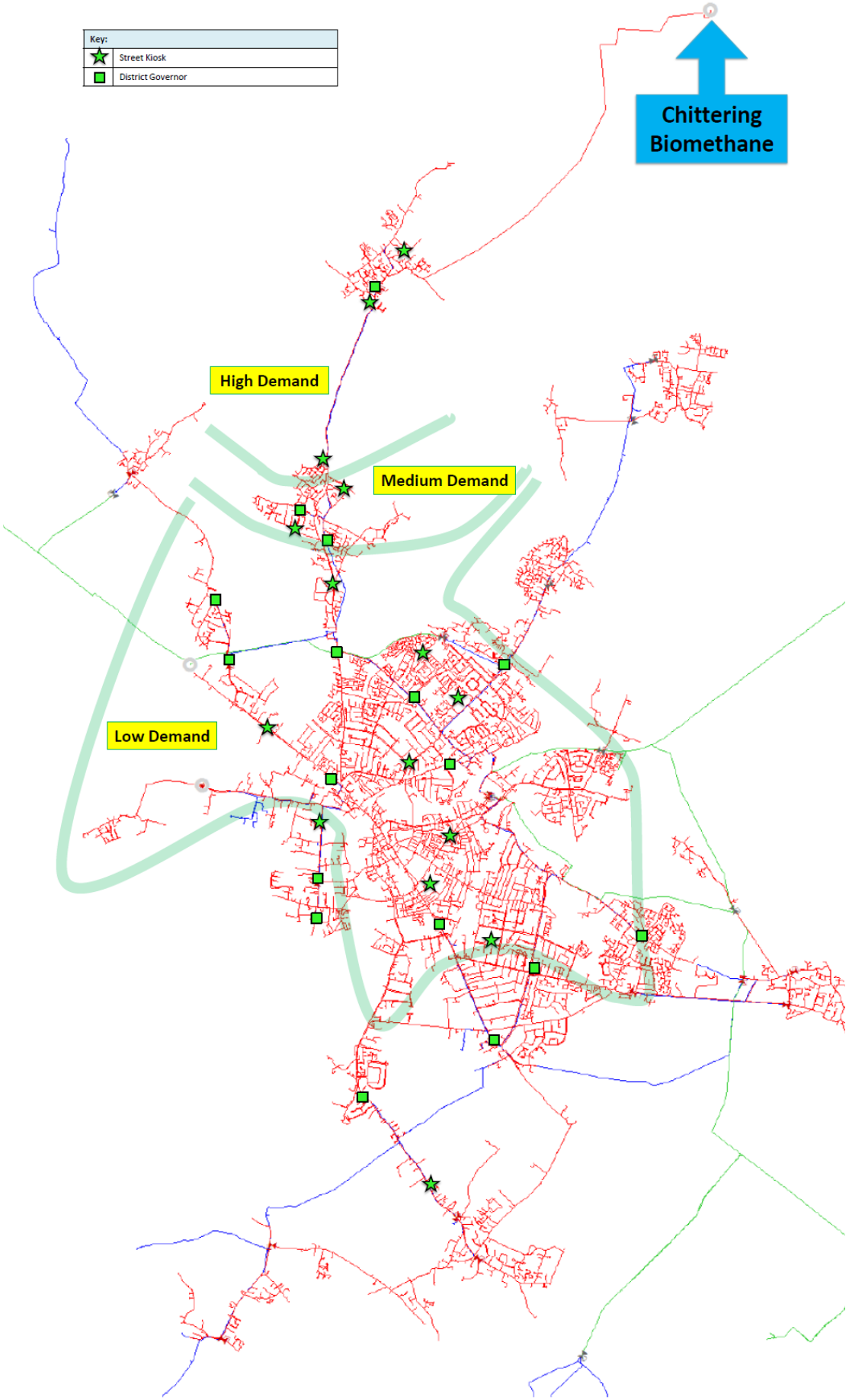
Term	Meaning
ACM	Asbestos-Containing Materials
AQ	Annual Quantity (of gas energy consumed expressed in kilowatt hours)
CBA	Cost-Benefit Analysis
CV	Calorific Value – expressed in mega Joules per cubic metre of gas (mJ/m^3) at standard temperature and pressure
DNO	(Electricity) Distribution Network Owner
DNV GL	Project partner of Cadent
ENA	Energy Networks Association
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
IGEM	Institute of Gas Engineers and Managers
LDZ	Local Distribution Zone (gas distribution networks in GB comprise 13 LDZs)
LV	Low Voltage (electricity supply)
NIC	Network Innovation Competition
OAD	Offtake Arrangements Document
PV	Photo-voltaic panel (which uses daylight to generate electricity)
RIIO	Ofgem regulatory framework: Revenue = Incentives + Innovation + Outputs
SDRC	Successful Delivery Reward Criteria
RoM	A “Rough order of Magnitude” estimate of system change implementation costs, produced by Xoserve.
SMIP	Smart Metering Implementation Programme

Term	Meaning
SMP	Supply Meter Point – constitutes an individual gas billing point on Xoserve's system
SMETS	Smart Metering Equipment Technical Specifications
UMS	Unmetered (electricity) Supply
UNC	Uniform Network Code

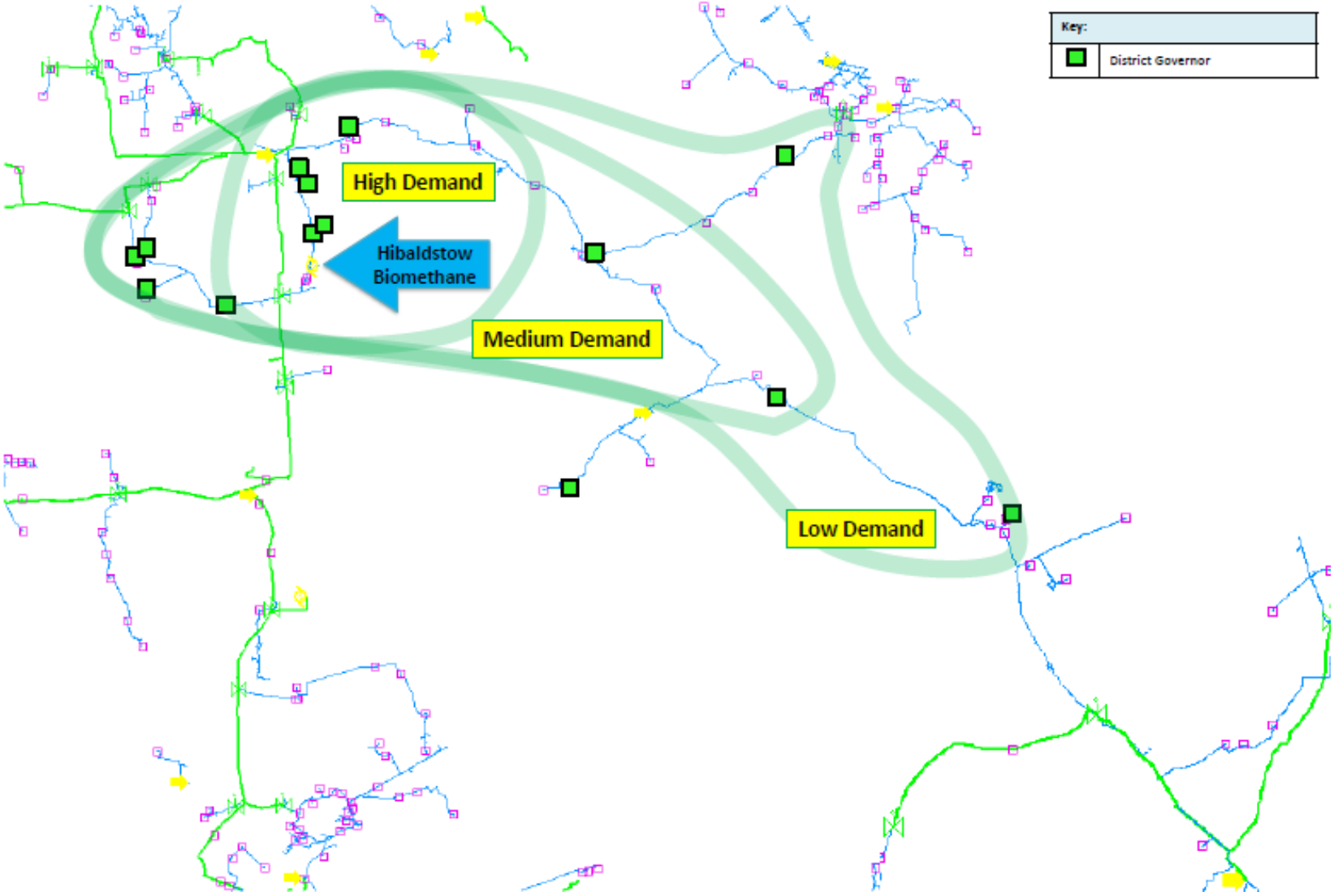
APPENDIX 1 – NIC04 FBM FIELD TRIAL EA CHITTERING: O2 Sensors & estimated furthest points in the network with the potential to receive biomethane under different demand conditions (Updated)



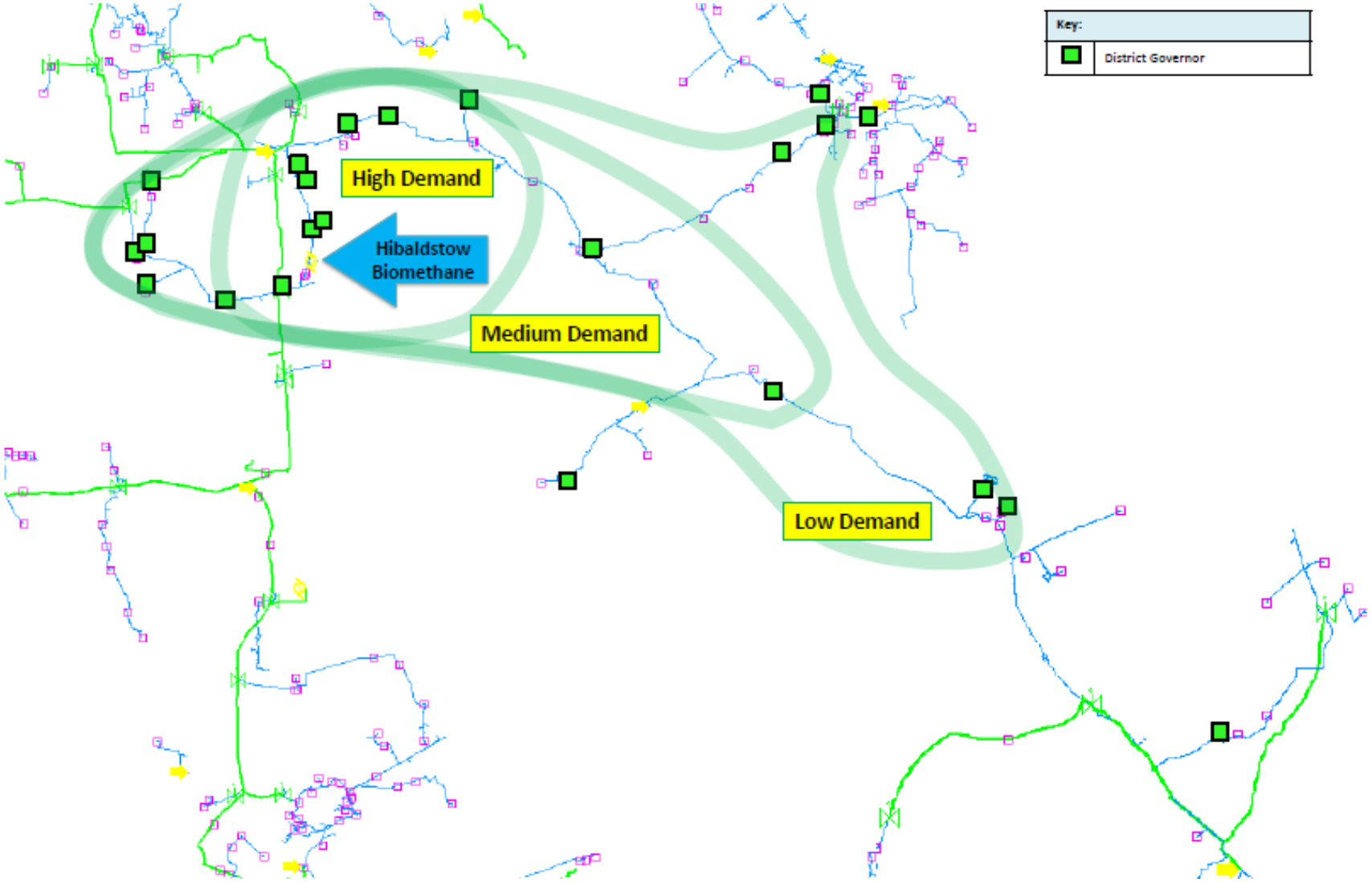
APPENDIX 2 - NIC04 FBM FIELD TRIAL EA CHITTERING: O2 Sensors & estimated furthest points in the network with the potential to receive Biomethane under different demand conditions (Original)



APPENDIX 3 - NIC04 FBM FIELD TRIAL EM HIBALDSTOW: O2 Sensors & estimated furthest points in the network with the potential to receive Biomethane under different demand conditions (Updated)



APPENDIX 4 - NIC04 FBM FIELD TRIAL EM HIBALDSTOW: O2 Sensors & estimated furthest points in the network with the potential to receive Biomethane under different demand conditions (Original)



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