Low Carbon Gas Preheating

Project Progress Report 01

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Table of Contents

1.0 Executive Summary 5
1.1 Project Snapshot 5
1.2 Project Summary 7
2.0 Project Manager's Report 8
2.1 Project Overview 8
2.2 Work Packages 9
2.2.1 WP01. Hotcat Small 9
2.2.2 WP02. Hotcat Medium 10
2.2.3 WP03. Hotcat Large 10
2.2.4 WP04. LP Steam Small 10
2.2.5 WP05. LP Steam Medium 11
2.2.6 WP06. LP Steam Large 11
2.2.7 WP07. Existing Technology (Boilerhouses (BH) and Water Bath Heaters (WBH)) 11
2.2.8 WP08. Website 12
2.2.9 WP09. Training / System Control 13
2.2.10 WP10. Project Management 13
2.3 The next 6 months 13
2.3.1 2014 builds – small alternative sites 13
2.3.2 2014 designs – for 2015 builds 14
2.3.3 Existing sites – 2014 design and build 14
2.3.4 Website development 14
3.0 Business Case Update 15
4.0 Progress Against Plan 16
4.1 Design and construction of the alternative technology sites 16
4.2 Design and construction of the existing technology sites 16
4.3 Management / manipulation of information to provide meaningful and easily understandable results 16
4.4 The next 6 months 17
5.0 Progress Against Budget 18
6.0 Bank Account 19
7.0 SDRC 20
7.1 Preheating Site Selection 20

7.1.1 Site Evaluation Criteria 20
7.1.2 Preheating Site Evaluation Results and Details of Analysis Undertaken 22
7.1.3 Sites Identified for Inclusion in the Project 23
7.2 Preheating Site & Technology Design 24
7.2.1 Smart Metering (Existing Technology) 24
7.2.2 HotCat and LP Steam Small Site Designs 24
7.2.3 HotCat & LP Steam Medium and Large Site Design 24
7.3 Technology Build & Installation 25
7.4 Successful trialling and demonstration of alternative preheating technologies 25
7.5 Successful estimation of system efficiencies of existing preheating technologies 26
7.6 Knowledge, Learning & Dissemination Strategy 27
7.7 Project Evaluation & Final Project Report 27
8.0 Learning Outcomes 28
9.0 IPR 29
10.0 Risk Management 30
11.0 Other 31
12.0 Accuracy Assurance Statement 32
Appendix A – Programme 33
Appendix B – Initial Site Selection and comments 34

Table of Figures

Figure 1. The LCGP Project 5
Figure 2. Proheat collecting their 'Best Network Improvement Award' with NGN alongside to celebrate. 8
Figure 3. The LCGP team collecting their award for 'Innovation of the Year' 8
Figure 4. The small Hotcat 'shell' in April 2014. 9
Figure 5. Small LP Steam unit in manufacture, May 2014. 10
Figure 6. Medium LP Steam preliminary design, April 2014. 11
Figure 7. Website summary (Phase 2 Target Completion Date – End June 2014) 12
Figure 8. Site selection iterations 21
Figure 9. Site Selection. Departments / process involved 22
Figure 10. Sites selected 23
Figure 11. Theoretical calculation of heating required (by NGN SCADA system) 26
Figure 12. Information route plan 27

1.0 Executive Summary

1.1 Project Snapshot

The transition to a low carbon energy sector in the UK presents Gas Distribution Networks (GDNs) with a number of challenges, including reducing the Business Carbon Footprint (BCF) of operating gas networks. The requirement for GDNs to preheat gas at pressure reduction stations (PRS) to avoid freezing the outlet pipework and ensure continuity of supply is a significant contributor to our BCF. GDN's preheating requirement is currently delivered using aging Water Bath Heaters (WBH) or more modern Boiler Package technologies (BH). However, there are several key issues that GDNs currently face when appraising investment options for preheating technology. Firstly, the whole life costs and in particular the carbon impact of currently available technologies is not understood. Secondly, there has been limited research or development in this area resulting in no financially viable alternative to existing technologies. And finally, the current shrinkage arrangements provide no incentive to target reductions in BCF associated with preheating.

The Low Carbon Gas Preheating (LCGP) seeks to address these issues directly. The project will install two 'alternative' preheating technologies across six NGN sites of differing scale - three Thermo Catalytic Systems (HotCat) and three Low Pressure Steam Systems (LP Steam). Smart metering technology will be installed on each of the six sites to provide data required to calculate and publish the system efficiency of each site and each technology. Additionally, smart metering technology will be installed separately on six sites that employ existing technologies. System efficiencies will be calculated and published for direct comparison.

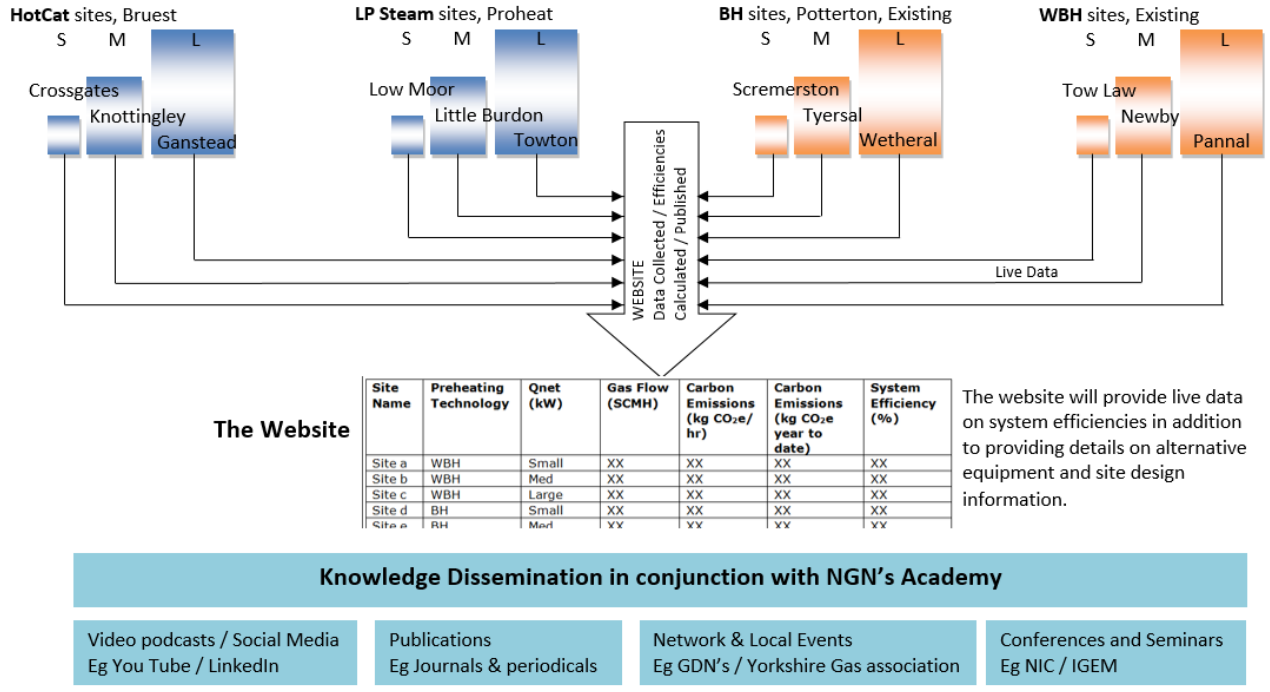


Figure 1. The LCGP Project

With reference to the above, the project can be summarised as follows:

1. Crossgates & Low Moor. To be completed during the summer construction window 2014.
2. Scremerston, Tyersal, Wetheral, Tow Law, Newby, Pannal. All additional signals to be designed by 30 June 2014. All to be installed by December 2014.
3. Website. Information 'route', management and development to be completed by December 2014.
4. Knottingley, Ganstead, Little Burdon, Towton. Designs to be complete in 2014. Construction to be completed during the summer construction window 2015.
5. Knowledge dissemination. Will commence in January 2015 once data can be analysed.

1.2 Project Summary

During the first 6 months of this project the LCGP project team has been established and the first SDRC's have been achieved as detailed in the LCGP Project Direction, 19.12.2013.

Equipment designs were completed in January for the small LP Steam unit from Proheat and for the small Hotcat unit from Bruest. Both items of equipment will be installed in the 2014 summer construction period. We experienced delays with the completion of the overall site designs but have addressed this problem by modifying the design contracts for all future work.

Site selection, the 12 sites with either existing preheating technology in service, or those where alternative technology will be installed, were finalised in February 2014 following an iterative process involving a number of departments within NGN. By March 2014 the LCGP website went live with basic information. The website will be the primary method of knowledge dissemination from the project.

Designs for the 6 sites with BHs (Boilerhouses) or WBHs (Water Bath Heaters) installed, known as the 'existing sites', will be completed by the end of June 2014. The installation contract for these sites is anticipated to be completed by December 2014. This will be the same time as the data management system is complete. December 2014 will be the first date where live energy efficiency and carbon footprint information for each of the technologies will be shared. In line with the SDRC's this will be for 8 of the 12 sites.

Once information is being published on the website the LCGP team will be in a position to analyze the results and begin to share the lessons learnt at public events in 2015 (e.g. IGEM, North East and Yorkshire seminars).

Design partners have been selected to complete the preheating designs for the medium and large alternative technology sites. Designing these 4 projects now will allow time for the designs to be completed and construction tenders to be issued well in advance of the planned construction period of summer 2015 as detailed in the SDRC's.

The focus over the next 6 month period will be in ensuring the 2 small alternative sites, Low Moor and Crossgates, are installed and operational, as well as ensuring the 6 existing sites are complete and operational to allow data to be calculated and published on the website in December 2014. Additionally the 4 alternative site designs must be well managed and new preheating equipment for installation in 2015 must be procured.

2.0 Project Manager's Report

2.1 Project Overview

On 16 December 2013 the LCGP team held a launch meeting to share the goals of the project and to discuss with all internal stakeholders the roles and responsibilities surrounding the successful delivery of the LCGP bid. 27 people were in attendance at the meeting representing 9 different NGN departments. The minutes of the meeting were widely circulated throughout the network. The purpose of such a meeting was to raise the profile of the project and to stress the importance of the required support from other departments within NGN in order to successfully deliver the project objectives over the next 4 years.

Figure 2. Proheat collecting their 'Best Network Improvement Award' with NGN alongside to celebrate.

In April team members were invited to the 2014 Energy Innovation Awards where one of NGN's partners, ProHeat Systems Ltd, collected the Best Network Improvement Award for their 'ultra efficient preheating concept'. The LCGP team have already procured one 'small' and one 'medium' sized unit from Proheat and will be installing a further 'large' unit in 2015. These units provide preheating to the NGN sites with system efficiency, carbon footprint and anticipated lifecycle costs all being produced from data collected.

The project profile was raised further at the 'Pride of NGN Awards Ceremony', held at Elland Road Football Stadium on 9 May 2014 where the LCGP team won the Innovation of the Year Award for 2013.

Figure 3. The LCGP team collecting their award for 'Innovation of the Year'

Over the last 6 months, the project team has been driven by the SDRC's. The LCGP team have focused on the designs of the small LP Steam and Hotcat units, on the site selection, the setting up of the website and on the design / construction of the additional instrumentation and meters at the 6 sites currently using BH's or WBH's (known as the 'existing' sites). The details of SDRC progress is contained in section 7.0.

2.2 Work Packages

The project has been broken down into 10 work packages. Each is detailed in this section but can be summarised as follows:

- WP01 to 06. Each of the 6 sites where alternative technology will be installed
- WP07. Work to be carried out on the 6 existing sites
- WP08. The website and information management
- WP09. Training / System Control
- WP10. Project Management

2.2.1 WP01. Hotcat Small

Figure 4. The small Hotcat 'shell' in April 2014.

Bruest, based in Kansas, USA, have been managed through a series of teleconferences involving Bruest, our designers and the LCGP team. We have successfully developed the design of the Hotcat to attempt to reduce the current carbon footprint as much as possible. This was made possible by carrying out a modification as detailed in NGN's bid whereby each of the heaters is fitted with a hi / lo gas flow capability. This ultimately reduces the amount of electricity used by the Hotcat and consequently reduces the carbon footprint of the unit based on current carbon equivalents of electricity and gas usage. For the first time in any Hotcat design, Bruest have also added fins to the internal tube to increase the surface area where radiant heat can be collected.

The small hotcat will be installed on NGN's Crossgates site. The Construction issue design drawings for this site were issued in May 2014 incorporating the specification for the additional signals required to allow the system efficiency and the carbon footprint to be calculated. A main works contractor has been appointed to build this site beginning in August 2014. The latest programme issued by our partners, Bruest shows that the Hotcat will be shipped from America mid-July 2014.

2.2.2 WP02. Hotcat Medium

A Scope of Services has been developed for this site and has been issued for tender to all suitable design companies on Major Projects' design framework. It is anticipated that the full detailed design will be completed by October / November 2014. A concept design phase drawing issue is scheduled for discussion at the HAZOP in mid-August 2014.

In line with the site selection criteria detailed in Section 7.1.1, Knottingley was selected for the medium sized Hotcat. Initial sizing of the preheating requirements has been carried out and a quotation for the Hotcat unit has been obtained from Bruest. Details and analysis of the quote are shown in the risk register. The unit will be procured following the HAZOP meeting scheduled for August 2014. This will ensure any major design changes will be incorporated into the supplier's design prior to the supplier's detailed design and / or manufacturing stages.

2.2.3 WP03. Hotcat Large

As detailed in section 7.1.1, Ganstead was selected for the large sized Hotcat. All other information relating to this work package is the same as item 2.2.2 at this stage.

2.2.4 WP04. LP Steam Small

Figure 5. Small LP Steam unit in manufacture, May 2014.

This unit will be delivered to site at Low Moor by late June 2014. Construction issue drawings for the overall site design and incorporating all additional signals to allow the system efficiency / carbon footprint to be calculated have been received. Factory testing of the Proheat unit began w/c 9 May 2014 with pressure testing of the heating coil and the condenser vessel. NGN's NIC Site supervisor, Andy Coyne witnessed the testing.

2.2.5 WP05. LP Steam Medium

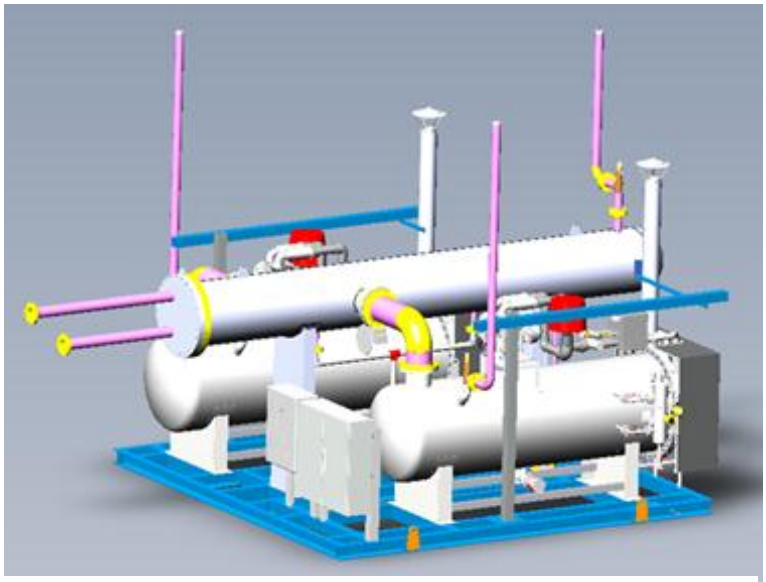


Figure 6. Medium LP Steam preliminary design, April 2014.

As per item 2.2.2, a Scope of Services document has been produced for this work package and the design stage is anticipated to be carried out simultaneously.

In line with the site selection criteria detailed in section 7.1.1, Little Burdon has been selected as the site to have the Medium LP Steam unit installed. The equipment is currently being designed by our partners, Proheat.

2.2.6 WP06. LP Steam Large

As per item 2.2.2, a Scope of Services document has been produced for this work package and the design stage is anticipated to be carried out simultaneously.

In line with the site selection criteria detailed in section 7.1.1, Towton has been selected as the site to have the Large LP Steam unit installed. We are currently working with Proheat to establish the optimum preheating solution for this site in terms of the equipment configuration to suit site requirements without adversely affecting the efficiency of the units. Essentially we need to decide how many condensers / evaporators would best serve the site's heating demand whilst also selecting the option with the lowest lifecycle cost.

2.2.7 WP07. Existing Technology (Boilerhouses (BH) and Water Bath Heaters (WBH))

We have set a target date of 30 June 2014 to ensure the existing sites have a construction issue design issued. This will then allow time to issue the designs for tender and install all necessary signals / meters etc. on all of the sites before the end of 2014.

Following the announcement that this project would be fully funded under the NIC initiative the site selection took place. This was then followed by the specification of the 8 signals required on each site (regardless of the preheating technology). As each site is unique in the signals it already has / needs to be able to produce the information required for LCGP calculations, the designs for these 6 sites could not be generic and could only begin following site selection.

The success of this works package is closely linked to WP08 – Website as the signals obtained from these sites can only be analysed once the information route from the site to the website has been established.

2.2.8 WP08. Website

Noting the criticality of this work package, the LCGP team began meetings with NGN's Information Services (IS) department in January 2014. To manage and control the information for this project there were various options available to the team. A fundamental decision had to be made quickly to decide whether to utilise the existing telemetry systems on site, which would mean having to push all information via the existing SCADA system, owned and managed by NGN's System Control department, or alternatively, to install a new stand-alone telemetry system at each site which would report directly back to a remote location where all information would then be managed, calculated and compared.

Through meetings with the Head of System Control it was clear that this project was well supported from senior management. It was decided that we should utilise the existing site telemetry, upgrade it where necessary, and utilise the capacity and the ability of the existing SCADA system for the benefit of this project. We anticipated that this would be a cost effective way to obtain all of the signals from site and calculate the information required.

After meeting with 2 potential web designers, we decided to use Digital Wellie, a company familiar to NGN's communications team through the recently building NGN's website.

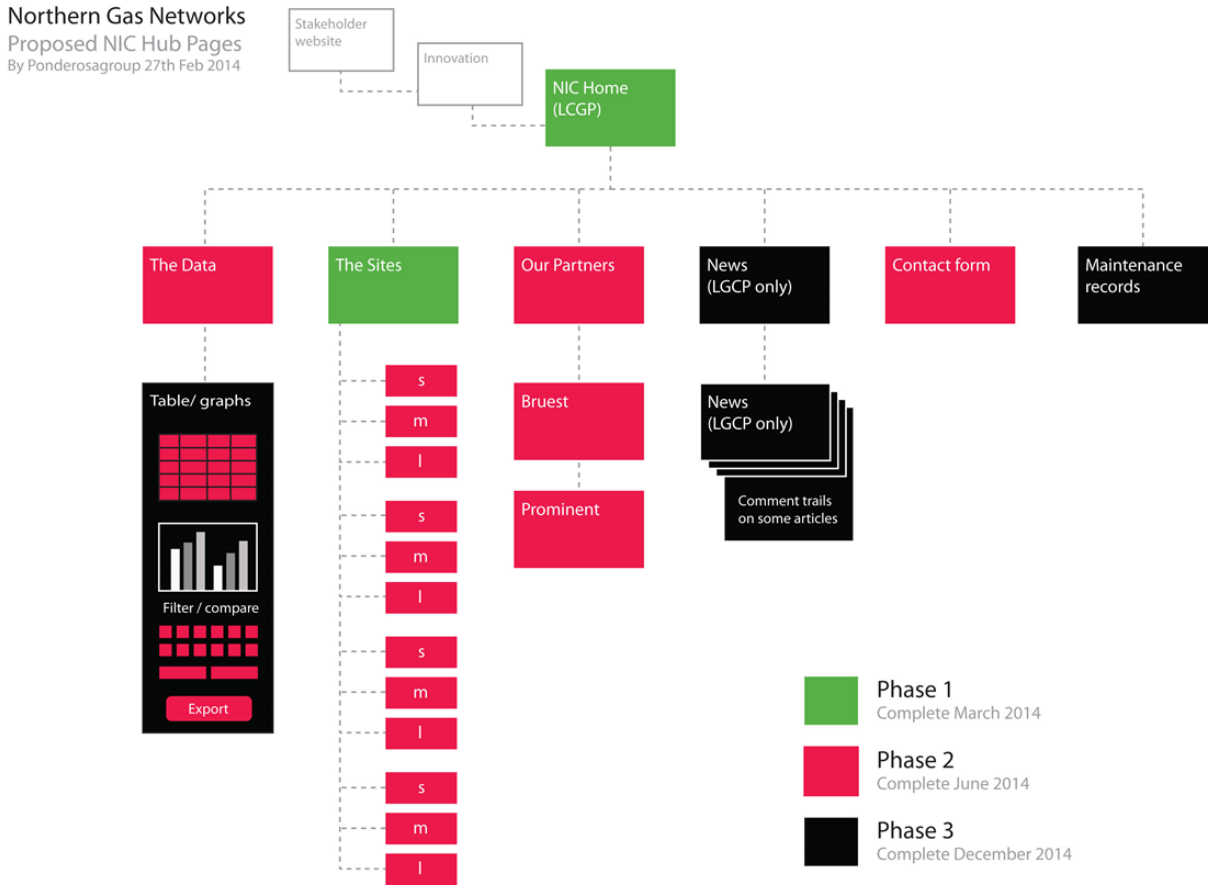


Figure 7. Website summary (Phase 2 Target Completion Date – End June 2014)

The NIC aspect of the website is now live and can be accessed at:

http://corporate.northerngasnetworks.co.uk/innovation/network-innovation-competition/

2.2.9 WP09. Training / System Control

The first 'alternative' preheating equipment will not be operational on an NGN site until the end of summer 2014. As such 'hands on' training has not yet been provided. However, factory visits to see Proheat's preheating equipment in manufacture at Chesterfield have been well attended by departments including Maintenance, Asset and Major Projects. These site visits are essential to familiarise colleagues with the technology.

Also, stakeholder engagement meetings have resulted in some extremely useful internal feedback. One colleague from asset suggested the actual training videos should be uploaded to YouTube. This would then allow the Maintenance teams to refresh their training prior to attending site. This is a suggestion which Digital Wellie are providing assistance on and one which can be used for the benefit of other networks simultaneously.

2.2.10 WP10. Project Management

The LCGP team consists of the following full time members, Adam Sadler, NIC Project Manager. Bill Fleming, NIC Project Engineer, and Andy Coyne, NIC Project Supervisor. These team members are all supported by a number of different staff based at NGN.

Assembling the team to deliver this project in line with the SDRC's has been a priority over the last 6 months. It is clear from the project budgets that the team has been established earlier than initially anticipated. This has been necessary to deliver the builds of the small Hotcat and LP Steam sites in the 2014 summer construction period. In addition to this we have also engaged an E&I design engineer to assist with the design of the existing sites. Whilst we initially thought that the internal resources of the Major Projects team could deliver this in-house it was agreed that, due to other pressures of the in-house E&I engineers, and the tight deadlines of this aspect of the project, it would be worthwhile bringing in additional support.

2.3 The next 6 months

Priorities over the next 6 months can be categorized into 4 main areas:

1. 2014 builds
2. 2014 designs – for 2015 build
3. Existing sites – 2014 design and build
4. Website development

2.3.1 2014 builds – small alternative sites

A contractor has been engaged and a detailed programme of how these sites will be built has been developed. As with any construction project the LCGP team need to be focussed on delivery of these two sites in the summer construction window of 2014. Once complete, Low Moor and Crossgates will be the first to have all signals installed to allow calculations to be performed of system efficiency and carbon footprint. Calculating and publishing this information for the first site will be huge project milestone as it will demonstrate that all calculations are working, the information route for the data has been cleared, and both of the alternative technologies have been designed, approved and appraised, and are operating successfully on UK gas sites.

2.3.2 2014 designs – for 2015 builds

There are 4 considerably sized projects to be designed during 2014 to allow construction of the medium and large alternative technology sites to be undertaken in the summer construction period of 2015. Design partners from NGN's framework have been selected to complete these 4 designs. Managing designers, stakeholders and design outputs carefully, with a view of deadlines and budgets will be an intensive process.

2.3.3 Existing sites – 2014 design and build

Ensuring the existing technology sites (WBHs and BHs) have the relevant signals is as important to the successful delivery of project data as managing the installation of the alternative technologies. Although not as labour intensive as installing a new preheating system, this aspect of the work will require careful planning to ensure approvals and appraisals are all received in a timely manner to allow works on site to be carried out. All of this aspect of the work should be completed over the next 6 months.

2.3.4 Website development

Following decisions taken over the last 6 months to utilise NGN's telemetry and SCADA system, the LCGP team must now focus on quickly addressing all obstacles / unknowns which will appear when attempting to transfer data from the gas sites to the website. This information route is key to being able to share the results of the project with other GDNs / interested parties. The route must be established in advance of December 2014 to allow Digital Wellie the time to develop the information into graphical format and to make it available for download etc. in January 2015. This is a particularly challenging aspect of the project as there are 3 software developers involved already and 3 NGN departments.

3.0 Business Case Update

The benefits to be gained from this project have not changed since the full submission. While challenges have been more clearly identified following site selection and design development, we still strongly believe that the four key objectives as follow will be achieved:

1. *Assess the potential for alternative technologies to meet preheating requirements across a range of heating system sizes and operating site parameters*.

   Following site selection we have identified sites suitable to deliver the information mentioned in this objective. Each of the technologies will be installed on a small, medium and large site. Each of the sites will have different operating characteristics which can be demonstrated in the website data.

2. *Provide an independent and accurate model for assessing the efficiency of preheating systems across the UK based on reducing business carbon footprint (BCF) and whole life costs*.

   Information on system efficiency will be provided in a standard format regardless of which preheating technology is being assessed. Data on carbon footprint and whole life costs will be provided on the website.

3. *Increase the technological options available to gas transporters for the replacement of preheating assets and increase the supply side of this market*.

   Along with our project partners we are currently developing the designs of the Hotcat and of the LP Steam unit. The developments we incorporate into the equipment we procure will be available for all other networks to gain the benefit. Design developments of the Hotcat have included increasing the number of hi / lo fire panels within the unit.

   Modifications to the LP Steam unit has included: Designing out the need for trace heating by modifying software; Modifying the electrical supplies to ensure the units restart automatically following a power cut to the site; and locating the Main Control Panel on the skid itself as well as the Burner Control Panels thereby reducing the amount of site testing required.

4. *Provide quantified data on system efficiency of both alternative and existing technologies that can provide the industry with information that will allow more informed investment decisions and a more efficient operation of the network*.

   Data provided on the website for the alternative and the existing technologies will be shared on the website. Details of operating and maintenance costs will be shared on the website to provide other networks with information to make more informed investment decisions.

4.0 Progress Against Plan

There are 3 labour intensive parts of the project which have all been focussed on over the last 6 months. These are:

1. Design and construction of the alternative technology sites
2. Design and construction of the existing technology sites
3. Management / manipulation of information to provide meaningful and easily understandable results

Before items 1 and 2 could begin, site selection needed to take place. The LCGP team used an iterative approach involving numerous NGN departments and succeeded in identifying all 12 sites in line with the SDRC date. This was a great step forward for the team allowing the designs to be focussed in a very specific way.

4.1 Design and construction of the alternative technology sites

Construction of the 6 alternative sites is planned over 2 summer shutdown periods. The first in 2014 where the small sites will be built, the second in 2015 where the medium and large sites will be built. Obtaining site designs has been a significant challenge for the LCGP team. This has had less of an impact on Crossgates than on Low Moor, due to the later delivery of the preheater, but has made the construction period a greater challenge. We still believe both sites will be built within the summer shut down period.

The builds planned for 2015 went out for design tender in May 2014. To avoid the problem experienced at Crossgates and Low Moor a very detailed Scope of Services document was produced to provide clear guidance and direction for the designer. In addition to this a fixed price contract will be offered, not a ‘cost +’ contract as at Crossgates and Low Moor.

Overall this aspect of the project is on programme.

4.2 Design and construction of the existing technology sites

The iterative process and the involvement of a considerable number of stakeholders in selecting the sites meant the programmed date of January 2014 was unrealistic. Whilst the site selection process did not go beyond the date provided as an SDRC, it has had an effect on the programme. To recover the lost time we have engaged Rush Construction Ltd, a framework design partner, to deliver the design aspect of this project with a tight deadline of 30 June 2014. Following this, a contractor will be engaged to make alterations to the electrical and instrumentation systems at each of the sites. This will now be completed by December 2014 in line with the SDRC.

4.3 Management / manipulation of information to provide meaningful and easily understandable results

This aspect involves various professionals from software companies including; Enzen, Digital Wellie and Schneider as well as different NGN departments including software / IS professionals from the IS team and System Control. This team has been considering how to analyse what the data is, how it can be transferred, and how it can be manipulated to produce the desired outputs. An IS Project Manager was allocated to this project and continues to drive the information management route forwards. The

original programme did not include a duration for this aspect and also for the testing / development period of the website functionality. As such, where we anticipated being able to send live information from each site, immediately after commissioning, we have had to concede that although the information will be being collected in advance of December 2014, the website functionality is not likely to be robust enough prior to this date to be able to share this information publically.

Should the website be ready to display this information in advance of the December 2014 we will endeavour to publish it.

4.4 The next 6 months

Over the next 6 months each of the three points above will be focussed on to achieve the publication of the small alternative site data and the existing site data on the website. The designs for the 2015 builds will also be closely managed to reduce the risk of missing the 2015 summer construction window.

5.0 Progress Against Budget

The project against budget summary is contained in the confidential annex.

6.0 Bank Account

The bank account details are contained in the confidential annex.

7.0 SDRC

7.1 Preheating Site Selection

7.1.1 Site Evaluation Criteria

35 sites were considered for their suitability for use within the trial. Details of all 35 sites and associated calculations of Qnet are contained within Appendix B. Where existing technology was being monitored we had to be sure that the systems were in a good enough condition to be certain that they would 'last' for the duration of the project. i.e. that they would not need to be replaced or significantly upgraded over the next four years. As such we considered sites complete with WBH's which had recently been upgraded with new control cabinets. Upgrading the control cabinets of a WBH generally results in fewer faults in operation but does not change the original burner or affect the method of preheating itself. We also selected Pannal, a site where the youngest WBH in the network is installed and operational.

In selecting the BH sites to be used in the trial we looked to use the youngest assets in the network. This not only ensures that the number of faults received can be expected to be kept to a minimum over the next four years, it also ensures we monitor the latest boiler technology giving BH's the opportunity to produce the efficiency / emissions of the latest BH technologies for comparison with other technologies. The youngest BH will be the one currently being installed at Wetheral in 2014. This BH will involve modulating boilers and individual pumps per boiler which the manufacturers provide as an energy efficiency measure.

Sites with high fault rates and 'old' preheating equipment currently installed were selected for consideration where alternative technology was planned to be installed.

Following analysis of information for the 35 sites, proposals were made based on:

1. Sizing criteria, i.e. whether the sites were 'small', 'medium' or 'large'. Qnet was calculated for each site. The definition of Qnet provided in the full submission is: 'Energy required by the gas stream in the form of heat (kW) to ensure that the downstream gas temperature is 0°C after the pressure cut'. The figures used to calculate this were those provided by NGN's LTS Planning department and are based on 10 year maximum anticipated flows and maximum design pressures.
2. Operational functionality. Sites where results could be considered 'standard' across all sites selected. i.e. where no 'special' features of additional pressure cuts or multiple outlet pressures would make the site 'unique' and would therefore affect the consistency of results over the trial.
3. 'Matching sites'. i.e. where more than one site feeds into the same network thus allowing one site with high efficiency technology to offset the carbon emissions of a site with an anticipated lower efficiency preheating system.
4. Sites which could be run all year round. Through assessing the site demand over a 12 month period it is clear that a large number of sites do not require preheating during the summer months. The network can be adjusted to allow the 12 sites being used for the trial to operate all year round. However, as gas flow during summer months is considerably lower than during winter months, it may be the case that some sites cannot provide results during summer depending on how we need to operate the network for robustness.

The below table shows the iterations between the initially proposed sites, selected as described previously, and comments received from various departments (contained in Appendix B) as to the suitability of these sites. Where text has a strikethrough, the table below it shows the revised site selected.

Table 1. Initial Site Selection

	Small (under 200kW)	Medium (201kW – 800kW)	Large (above 801kW)
Existing BH (These BH's need to last longer than 3 years)	~~Cowpen Bewley (19-28ar) 89kW~~	Tyresal 321kW	Wetheral 1871kW
Existing WBH (These WBH's need to last longer than 3 years)	Tow Law 58kW	Newby 278kW	~~Pannal (This was not agreed as a potential site, however, due to the lack of 'large' sites identified in the list I will request details of Pannal from LTS Planning) TBC kW~~
LP Steam	Low Moor 61kW	Little Burdon 710kW	Saltwick This was identified as a site where the WBH could be monitored. Again, due to the lack of 'large' sites, and after discussions with Matt L, we feel this will be the best site to upgrade. The new panels can be re-used on another site and installed by STS, ML) 1229 to 1906kW
HotCat	Crossgates 144kW	Knottingley 300kW	Ganstead I see this as the biggest risk to the network. As such, I think on this scheme, noting there is a BH on site at the moment, we should look to leave the HX in the gas stream as a backup. Should there be a big problem with the HotCat for any reason we can then install a new BH after the NIC monitoring period. The scheme will most probably require an electrical capacity upgrade (as would any scheme where the large HotCat was installed!) 666 to 1271kW

Table 2. Considered Site Selection

	Small (under 200kW)	Medium (201kW – 800kW)	Large (above 801kW)
Existing BH (These BH's need to last longer than 3 years)	Scremerston (70-6.9Bar) 169kW	Tyresal 321kW	Wetheral 1871kW
Existing WBH (These WBH's need to last longer than 3 years)	Tow Law 58kW	Newby 278kW	~~Bishop Auckland 1229-1906 kW~~
LP Steam	Low Moor 61kW	Little Burdon 710kW	~~Saltwick 1229 to 1906kW~~
HotCat	Crossgates 144kW	Knottingley 300kW	Ganstead 666 to 1271kW

Table 3. Final Considered Site Selection

	Small (under 200kW)	Medium (201kW – 800kW)	Large (above 801kW)
Existing BH (These BH's need to last longer than 3 years)	Scremerston (70-6.9Bar) 169kW	Tyresal 321kW	Wetheral 1871kW
Existing WBH (These WBH's need to last longer than 3 years)	Tow Law 58kW	Newby 278kW	Pannal 4261kW
LP Steam	Low Moor 61kW	Little Burdon 710kW	Towton 2292kW
HotCat	Crossgates 144kW	Knottingley 300kW	Ganstead 666 to 1271kW

Figure 8. Site selection iterations

7.1.2 Preheating Site Evaluation Results and Details of Analysis Undertaken

The below diagram shows the departments involved in selecting the sites and the iterative process employed.

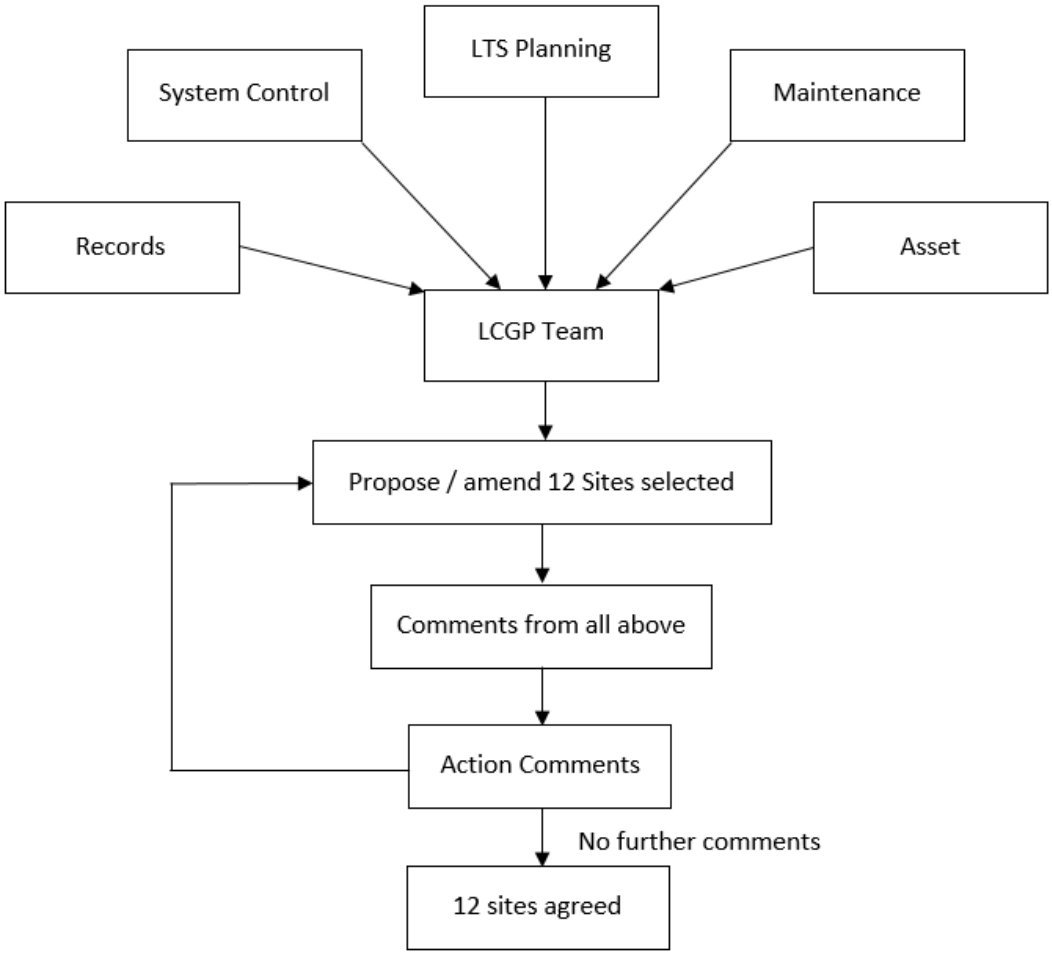


Figure 9. Site Selection. Departments / process involved

7.1.3 Sites Identified for Inclusion in the Project

The sites identified below were finalised in February 2014. This then allowed scoping documents to be produced to detail the exact requirements of each of the builds.

Technology	Alternative / Existing	Size	Site Selected
Hotcat	Alternative	Small	Crossgates*
Hotcat	Alternative	Medium	Knottingley
Hotcat	Alternative	Large	Ganstead
LP Steam	Alternative	Small	Low Moor*
LP Steam	Alternative	Medium	Little Burdon
LP Steam	Alternative	Large	Towton
Boilerhouse	Existing	Small	Scremerston
Boilerhouse	Existing	Medium	Tyersal
Boilerhouse	Existing	Large	Wetheral
Water Bath Heater	Existing	Small	Tow Low
Water Bath Heater	Existing	Medium	Newby
Water Bath Heater	Existing	Large	Pannal

Figure 10. Sites selected

*Sites were identified prior to the award of the NIC funding to ensure the projects could be progressed in 2014.

7.2 Preheating Site & Technology Design

7.2.1 Smart Metering (Existing Technology)

To obtain sufficient information to calculate the energy efficiency and carbon footprint, 8 pieces of live information (signals) need to be obtained from each site regardless of the preheating technology. These include:

1. Inlet Gas Temperature (to preheater)
2. Outlet Gas Temperature (after pressure cut)
3. Ambient Air Temperature
4. Site Inlet Gas Pressure
5. Site Outlet Gas Pressure
6. Preheater Gas Consumption (smart meter)
7. Preheater Electricity Consumption (smart meter)
8. Site Gas Flow

None of NGN's sites have all of these signals already installed as some are unique to the energy efficiency calculation being carried out as part of this project. NGN identified which signals were missing on each site, cross referenced other work to be carried out on the sites selected, and engaged a consultant, Rush Associates, to design the additional items required. By cross referencing other works being carried out within the Major Projects department we were able to add the signals required for Pannal and Wetheral onto ongoing projects.

The designs for the existing technologies will all be complete by June 2014. This will then allow the installation of the additional instrumentation by December 2014 in line with the SDRC's.

7.2.2 HotCat and LP Steam Small Site Designs

Approval for manufacture was given to both Proheat (Low Moor – LP Steam) and Bruest (Crossgates - Hotcat) by January 2014. Delivery of the LP Steam unit is anticipated mid June 2014, delivery of the Hotcat to Liverpool docks is expected mid-August 2014. Whilst we encountered problems with the overall site design associated with the preheating, resulting in the site designs not being complete and issued 'For Construction' until May 2014, this will not affect the installation of the technology to these sites in 2014. Low Moor site installation commenced on 9 June 2014. Crossgates site installation will commence at the start of August 2014. All information from these sites will be feeding back to the SCADA system by October 2014. However, it should be noted that the live energy calculation which will ultimately be published on the website is dependent on the progress of the IS aspect of the project.

7.2.3 HotCat & LP Steam Medium and Large Site Design

All 4 medium and large alternative technology sites are complex sites with multiple RIIO outputs to be achieved in this RIIO period. For NGN to deliver all of the RIIO outputs as efficiently as possible, as well as to install the new preheating technology, the Major Projects department have pulled together detailed scopes of services before tendering for a third party designer from the framework. These detailed scopes of services provide clear guidance to the designer of NGN's requirements and as such, reduce the risk of overrunning design budgets and programmes. We aim to engage design companies

from the framework by the end of June 2014. This will allow sufficient time to complete the site designs by December 2014 in line with the SDRC.

7.3 Technology Build & Installation

As detailed in 7.2.1, the installation of the additional signals on the existing sites, including the smart metering, will be carried out following the completion of the design in June 2014.

Our intention is to engage one contractor from our framework to complete this aspect of the project. This will result in one contractor installing equipment consistently and will allow the LCGP team to project manage this element with only one contract. The contract will stipulate a completion date of December 2014 although the contractor will be encouraged to complete all works ahead of schedule wherever possible.

All required signals for the additional metering on the alternative technology medium and large sites will be installed at the same time as the installation of the preheater equipment in summer 2015. This will be well in advance of the December 2015 deadline as detailed in the SDRC's.

7.4 Successful trialling and demonstration of alternative preheating technologies

The website has been established with click through pages for each site in the test environment, although this is not yet live. When users click on any particular site, overviews of the site design and of the equipment being installed will be available. At present, we have construction issue information for the preheating equipment and the overall site design for the small Hotcat site - Crossgates and the small LP Steam site – Low Moor. Once we have agreed the level of detail required to give a good overview of the designs, we will add this content to the website. This will be uploaded by the date given in the SDRC of December 2014.

The knowledge and learning associated with the design, installation and commissioning etc of the alternative preheating technologies will be added to this same area of the website after each site has become operational. We anticipate that all learning from this element will be available and published in line with the SDRC by January 2016 however, we intend to upload content to the website on a site by site basis and hence we begin to add this content in advance of the agreed SDRC.

7.5 Successful estimation of system efficiencies of existing preheating technologies

As we stated in the full submission, to calculate the overall system efficiency of the preheating equipment we have to calculate how much energy the gas stream needs in theory, then we need to find how much energy the preheating equipment is taking in practice. By dividing one by the other we get the overall system efficiency.

NGN's System Control department have developed an algorithm within the SCADA system to calculate the energy required by the gas stream. This is the first time there has been a need for this value to be calculated by the SCADA system. Once all additional signals are installed, the theoretical value of heat required can be calculated on each of the 12 sites, and can be performed every hour.

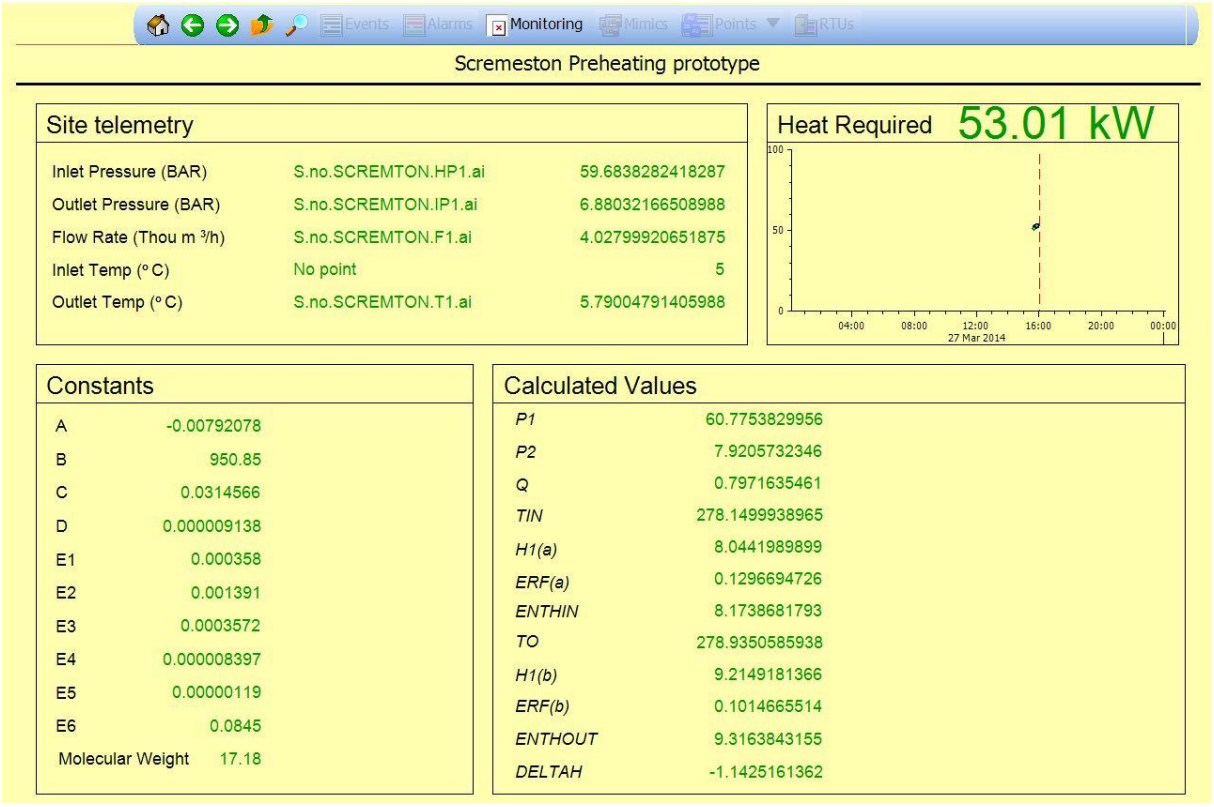


Figure 11. Theoretical calculation of heating required (by NGN SCADA system)

Whilst it was our intention of sharing the results 2 months after the installation of each site, this is likely not to be possible until the method of sending information from each site via SCADA, via 'Business Administration' and on to the website provider, is resolved (see section 7.6). The 2 month period represented a 'stretch' target within the project and does not impact upon the SDRC set out within the project direction of December 2014.

We remain on target to have all 12 sites reporting back to the website via live feed by December 2015. Our intention is to have the technology ready and operational by December 2014, with just the medium and large alternative sites not feeding information through as they will not be built until 2015.

7.6 Knowledge, Learning & Dissemination Strategy

Over this initial period the team have focussed on establishing the project website as the central tool for knowledge dissemination. The team had to make some fundamental decisions early on in the project to decide whether to use existing telemetry which would require the support of other internal NGN departments, or to use a 'piggy back' stand alone, telemetry system on each of the 12 sites.

It was decided that the information would be managed through existing NGN departments. This was not only to do with the size and capacity of the existing NGN SCADA system, but also to do with managing potential problems with a stand alone telemetry system which would have been unsupported by any other departments within the business. The decision to utilise internal departments was also made easier by the enthusiasm of the IS Department and of the System Control Department to be involved in the project.

The website was launched by our selected web designers – Digital Wellie, in March 2014 here:

http://corporate.northerngasnetworks.co.uk/innovation/network-innovation-competition/

Although it currently shows no live information, the structure of the website has been agreed, along with initial contract details and basic information.

The LCGP team are currently working on the below process map and establishing a 'route' for information to get from each of the 12 gas sites, to the website. It is anticipated that this route will be established before December 2014 as detailed in the SDRC. Following the establishment of the information route graphs of system efficiency and carbon emissions will be available in addition to options for users to compare how system efficiencies change with respect to one and other. Data will be downloadable for other networks / interested to parties to analyze as they choose.

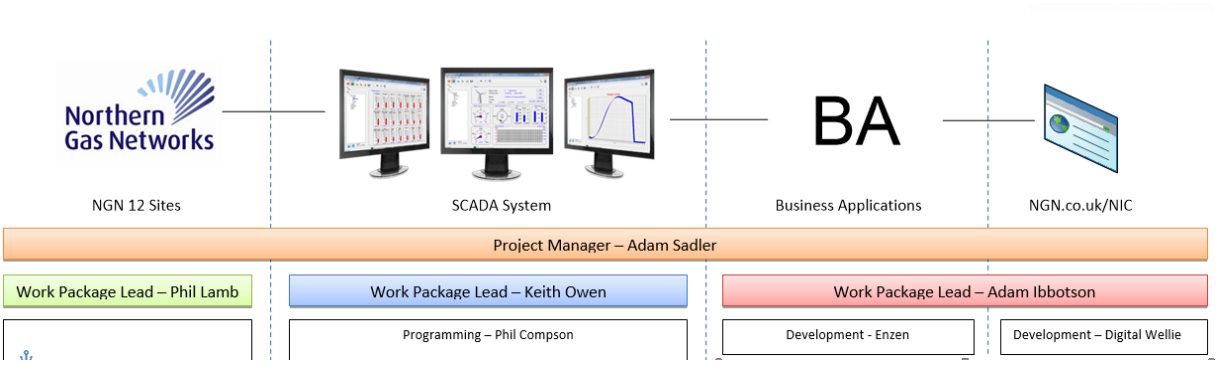


Figure 12. Information route plan

7.7 Project Evaluation & Final Project Report

The detailed final report is not yet due to be produced.

8.0 Learning Outcomes

The last 6 months has seen the LCGP team establish the means to share learning outcomes (the website) to allow the team to share information relating the design, build and operation of the new equipment over the following years. As such, there have been relatively few learning outcomes to share at this stage of the project.

We anticipate that over the coming months we will be able to upload design information for the small alternative technologies, as well as the designs for the existing sites.

We anticipate that the preheating efficiencies and other data will be shown on the website by December 2014 (for the sites where the build has been completed as planned). Following this the LCGP team can begin analysis of the results and begin to share this information at local and national events. The first event where the latest project knowledge will be shared will be the Low Carbon & Network Innovation Conference, Aberdeen, 20-22 October 2014.

9.0 IPR

No relevant IPR's have been generated or are forecast to be generated.

10.0 Risk Management

The project risk register has been updated and is contained in the confidential annex.

As the project progresses individual lines of the risk and opportunities register can be closed to allow us to begin to gain some project cost certainty. In the project so far, as expected, we have not yet closed out many of the individual items. Analysis of the risks and opportunities is also contained in the confidential Annex.

11.0 Other

All information and progress relating to the LCGP project is contained in the sections above or in the confidential annex.

12.0 Accuracy Assurance Statement

The report has been prepared in accordance with the Network Innovation Competition Guidance document published by Ofgem. Additionally, this report has been subject to review and challenge via NGN's independent Internal Audit function to provide further assurance on the accuracy and integrity of the data and information being presented.

Senior Manager Sign Off:

I can confirm that the process followed to compile and check this return is compliant with the control requirements outlined above have been completed and the information presented is robust, accurate and complete.

Name: Martin Alderson

Position: Asset Risk Management & Safety Director

Signature: 

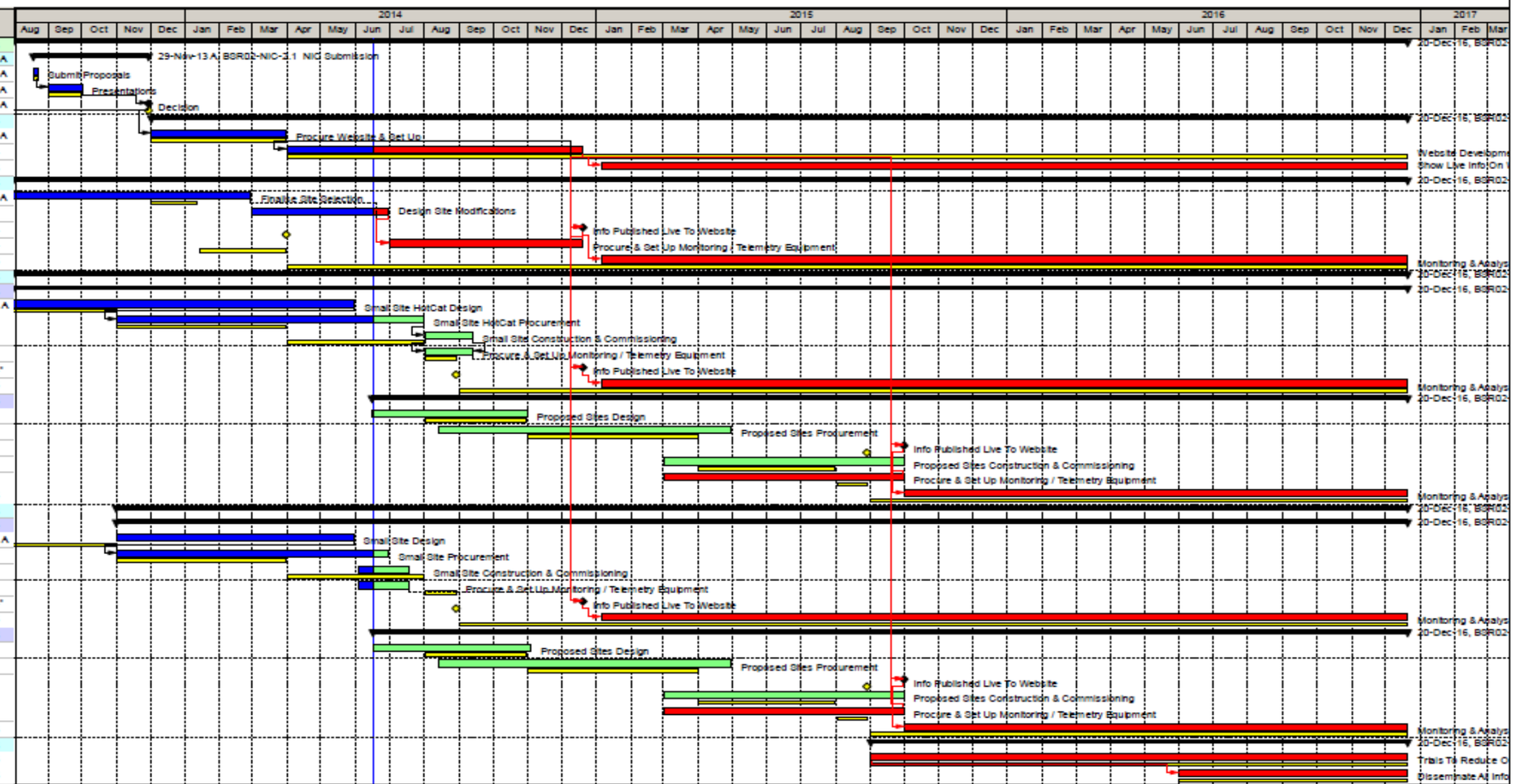
Date: 19 June 2014

Appendix A – Programme

Data Date
17-Jun-14

BSR02 - Preheating NIC Project Programme

ID	Activity Name	Start	Finish
BSR02-NIC-2	BSR02 - Preheating NIC Project Programme	01-Aug-13 A	20-Dec-16
BSR02-NIC-2.1	NIC Submission	19-Aug-13 A	29-Nov-13 A
A1000	Submit Proposals	19-Aug-13 A	23-Aug-13 A
A1010	Presentations	02-Sep-13 A	01-Oct-13 A
A1020	Decision		29-Nov-13 A
BSR02-NIC-2.2	Website	02-Dec-13 A	20-Dec-16
A1050	Procure Website & Set Up	02-Dec-13 A	31-Mar-14 A
A1060	Website Development	01-Apr-14 A	19-Dec-14
A1130	Show Live Info On Website	05-Jan-15	20-Dec-16
BSR02-NIC-2.3	Water Bath Heater & Boiler Sites (Existing Sites)	01-Aug-13 A	20-Dec-16
A1030	Finalise Site Selection	01-Aug-13 A	28-Feb-14 A
A1140	Design Site Modifications	01-Mar-14 A	30-Jun-14
A1120	Info Published Live To Website		19-Dec-14
A1040	Procure & Set Up Monitoring / Telemetry Equipm	01-Jul-14*	19-Dec-14
A1070	Monitoring & Analysis of Small, Medium & Large	05-Jan-15	20-Dec-16
BSR02-NIC-2.4	Hot Cat Sites	01-Aug-13 A	20-Dec-16
BSR02-NIC-2.4.1	Small Site (Crossgates)	01-Aug-13 A	20-Dec-16
A1080	Small Site HotCat Design	01-Aug-13 A	31-May-14 A
A1090	Small Site HotCat Procurement	01-Nov-13 A	31-Jul-14
A1100	Small Site Construction & Commissioning	01-Aug-14	12-Sep-14
A1110	Procure & Set Up Monitoring / Telemetry Equipm	01-Aug-14	12-Sep-14
A1360	Info Published Live To Website		19-Dec-14*
A1320	Monitoring & Analysis of Small Site	05-Jan-15	20-Dec-16
BSR02-NIC-2.4.2	Medium & Large Sites (Knottingley & Garstead)	16-Jun-14 A	20-Dec-16
A1200	Proposed Sites Design	16-Jun-14 A	31-Oct-14
A1210	Proposed Sites Procurement	14-Aug-14*	30-Apr-15
A1370	Info Published Live To Website		30-Sep-15
A1220	Proposed Sites Construction & Commissioning	02-Mar-15*	30-Sep-15
A1230	Procure & Set Up Monitoring / Telemetry Equipm	02-Mar-15*	30-Sep-15
A1330	Monitoring & Analysis of Medium & Large Sites	01-Oct-15	20-Dec-16
BSR02-NIC-2.5	LP Steam Sites	01-Nov-13 A	20-Dec-16
BSR02-NIC-2.5.1	Small Site (Low Moor)	01-Nov-13 A	20-Dec-16
A1240	Small Site Design	01-Nov-13 A	30-May-14 A
A1250	Small Site Procurement	01-Nov-13 A	30-Jun-14
A1260	Small Site Construction & Commissioning	04-Jun-14 A	18-Jul-14
A1270	Procure & Set Up Monitoring / Telemetry Equipm	04-Jun-14 A	18-Jul-14
A1380	Info Published Live To Website		19-Dec-14*
A1350	Monitoring & Analysis of Small Site	05-Jan-15	20-Dec-16
BSR02-NIC-2.5.2	Medium & Large Sites (Little Burden & Towton)	16-Jun-14 A	20-Dec-16
A1280	Proposed Sites Design	16-Jun-14 A	03-Nov-14
A1290	Proposed Sites Procurement	14-Aug-14*	30-Apr-15
A1390	Info Published Live To Website		30-Sep-15
A1300	Proposed Sites Construction & Commissioning	02-Mar-15*	30-Sep-15
A1310	Procure & Set Up Monitoring / Telemetry Equipm	02-Mar-15*	30-Sep-15
A1340	Monitoring & Analysis of Medium & Large Sites	01-Oct-15	20-Dec-16
BSR02-NIC-2.6	Information Sharing	01-Sep-15	20-Dec-16
A1400	Trials To Reduce Overall NGN Business Carbor	01-Sep-15*	20-Dec-16
A1410	Disseminate All Information Through Presentatic	01-Jun-16	20-Dec-16



Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Project Baseline Bar
Milestone
Baseline Milestone
Summary

Page 1 of 1

Date	Revision	Checked	Approved
18-Nov-13	Rev 01 Initial		

Appendix B – Initial Site Selection and comments

	NIC SITE SELECTION INFORMATION		Max heat required						Min heat required								
	BOILERHOUSES (email 1)	Brief Description of Site	Max Inlet Pressure	Outlet Pressure	Gas Flow Rate	Lowest Anticipated Inlet Temperature	Outlet Temperature Set Point	Qnet	Min Inlet Pressure	Outlet Pressure	Gas Flow Rate	Lowest Anticipated Inlet Temperature	Outlet Temperature Set Point		Inlet Pressure Assumptions	Outlet Temperature Set Point	Other Information
1	West Edmondsley	38 to 19 bar PRI (Regulator)	38.0	19	33.36	5	0	79	26.0	19	33.36	5	0		Design Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
2	Plausworth	19 to 2 bar PRI	19.0	2	25.89	5	0	47	10.0	2	25.89	5	0		Design Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
3	North Seaton	19 to 2 bar PRI	19.0	2	11.17	5	0	20	7.0	2	11.17	5	0		Design Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
4	Scremeston	70 to 6.9 bar PRI	70.0	6.9	12.36	5	0	169	49.0	6.9	12.36	5	0		Expected Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
5	Cowpen Bewley	50 bar NTS Offtake	70.0	50-28	182.69	5	0	489-1545	38.0	50-28	182.69	5	0		NTS Assured Pressure	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
	Cowpen Bewley	19 to 2 bar PRI	19.0	2	21.69	0	0	89	15.0	2	21.69	0	0		Expected Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
	Cowpen Bewley	50 to 19 bar PRI (Regulator)	50.0	19	127.82	0	0	1027	28.0	19	127.82	0	0		Expected Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
6	Eltringham	19 to 2 bar PRI	19.0	2	9.96	5	0	18	10.0	2	9.96	5	0		Expected Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
7	Tyresal (aware that this site is to b	38 to 17 bar PRI	38.0	17	111.50	5	0	321	20.0	17	111.50	5	0			Greater than 0 degrees C	Maximum flow may be present at minimum pressure
8	Greatham	19 to 2 bar PRI	19.0	2	10.20	3	0	28	10.0	2	10.20	3	0		Design Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
9	Wetheral	19 bar NTS Offtake	85.0	19	126.08	5	0	1871	45.7	19	126.08	5	0			Greater than 0 degrees C	Maximum flow may be present at minimum pressure
	Wetheral MP Supply	19 to 2 bar PRI	19.0	2	24.13	0	0	99	15.0	2	24.13	0	0			Greater than 0 degrees C	Maximum flow may be present at minimum pressure
10	Keswick	19 to 2 bar PRI	19.0	2	3.75	5	0	7	10.0	2	3.75	5	0		Design Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
	WATERBATH HEATERS (email	Brief Description of Site	Max Inlet Pressure	Outlet Pressure	Gas Flow Rate	Lowest Anticipated Inlet Temperature			Min Inlet Pressure	Outlet Pressure	Gas Flow Rate	Lowest Anticipated Inlet Temperature			Inlet Pressure Assumptions	Outlet Temperature Set Point	Other Information
11	Hepscott Regulator 19bar	70 to 19 bar PRI (Regulator)	70	19	30.20	5	0	324	34	19	30.20	5	0			Greater than 0 degrees C	Maximum flow may be present at minimum pressure
	Hepscott	19 to 6.9 bar PRI	19	6.9	9.78	5	0	7	10	6.9	9.78	5	0			Greater than 0 degrees C	Maximum flow may be present at minimum pressure
12	Tow Law	2 bar NTS Offtake	85	2	3.08	5	0	58	38	2	3.08	5	0		NTS Assured Pressure	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
13	Bishop Auckland	38 bar NTS Offtake	69	38-26	219.17	5	0	1229-1906	38	38-26	219.17	5	0		NTS Assured Pressure	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
14	Dewsbury	38 to 17 bar PRI (Regulator)	38	17	97.58	5	0	281	20	17	97.58	5	0			Greater than 0 degrees C	Maximum flow may be present at minimum pressure
	Dewsbury	17 to 2 bar PRI	17	2	33.53	5	0	45	10	2	33.53	5	0			Greater than 0 degrees C	Maximum flow may be present at minimum pressure
15	Newby	40 to 12 bar PRI (Regulator)	40	12	60.35	5	0	278	24	12	60.35	5	0		Expected Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
16	Seal Sands	50 to 25 bar (Regulator)	50	25	19.27	5	0	76	28	25	19.27	5	0			Greater than 0 degrees C	Maximum flow may be present at minimum pressure
	Seal Sands	50 to 17 bar PRI (Regulator)	50	17	3.44	5	0	20	28	17	3.44	5	0			Greater than 0 degrees C	Maximum flow may be present at minimum pressure
17	Middleston Moor	38 to 2 bar PRI	38	2	52.64	5	0	341	24	2	52.64	5	0		Expected Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
18	Elton offtake	40 bar NTS Offtake	69	40-24	172.46	5	0	876-1587	50	40-24	172.46	5	0		NTS Assured Pressure	Greater than 0 degrees C	Gas Flow Rate is 252.2 if Sembcorp take max SHQ
19	Humbleton offtake	NTS Offtake	70	4	0.85	5	0	12	38	4	0.85	5	0		NTS Assured Pressure	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
20	Saltwick (Big)	38 bar NTS Offtake	69	38-26	219.17	5	0	1229-1906	46	38-26	219.17	5	0		NTS Assured Pressure	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
21	Pannal	38 bar NTS Offtake	70	38	725.00	5	0	4261	44.1	38	725.00	5	0		NTS Assured Pressure	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
22	Towton	38 bar NTS Offtake	70	38	390.000	5	0	2292 (1352 @ 230)	38	38	390.000	5	0		NTS Assured Pressure	Greater than 0 degrees C	Flow rate of 230 is with normal operation, can work at 390 when required, and has been recorded doing so in the last few years. Should be sized according to this max capacity
	ALTERNATIVE TECHNOLOGY (	Brief Description of Site	Max Inlet Pressure	Outlet Pressure	Gas Flow Rate	Lowest Anticipated Inlet Temperature			Min Inlet Pressure	Outlet Pressure	Gas Flow Rate	Lowest Anticipated Inlet Temperature			Inlet Pressure Assumptions	Outlet Temperature Set Point	Other Information
23	Wilton Westgate	40 to 0.45 bar PRI	6.9	0.45	17.76	5	0	-12	0.45	0.45	17.76	5	0		Interstage Pressure	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
	Wilton Westgate	40 to 2 bar PRI	6.9	2	3.57	5	0	-4	2	2	3.57	5	0		Interstage Pressure	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
	Wilton Westgate	40 to 6.9 bar PRI	40	6.9	21.33	5	0	124	23.5	6.9	21.33	5	0		Guaranteed Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
24	Asselby (info available via major p	7 bar NTS Offtake	70	7	13.73	5	0	187	38	7	13.73	5	0		NTS Assured Pressure	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
	Asselby (info available via major p	38 bar NTS Offtake	70	38	9.95	5	0	58	38	38	9.95	5	0		NTS Assured Pressure	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
25	Ganstead	38 bar NTS Offtake	69	38-18	118.83	5	0	666-1271	38	38-18	118.83	5	0		NTS Assured Pressure	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
26	Saltend	38 to 17 bar PRI (Regulator)	38	17	130.30	5	0	375	30.6	17	130.30	5	0		Expected Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
	Saltend	17 to 7 bar PRI	17	7	21.57	0	0	52	10	7	21.57	0	0		Design Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
	Saltend	17 to 2 bar PRI	17	2	19.95	0	0	72	10	2	19.95	0	0		Design Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
27	Bullerthorpe Lane	38 to 17 bar PRI (Regulator)	38	17	161.41	5	0	464	20	17	161.41	5	0		Expected Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
28	Carcroft	24 to 3.4 bar PRI	24	3.4	23.73	5	0	64	13	3.4	23.73	5	0		Expected Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
29	Knottingley	38 to 2 bar PRI	38	2	46.35	5	0	300	10	2	46.35	5	0		Design Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
	Knottingley	38 to 24 bar PRI (Regulator)	38	24	17.43	5	0	20	22	24	17.43	5	0		Expected Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
30	Shap	19 to 2.9 bar PRI	19	2.9	10.22	1	0	35	14	2.9	10.22	1	0		Expected Minimum	Greater than 0 degrees C	Outlet pressure to NGN IP System is 2.9 bar as listed, outlet pressure to Shapfell Limestone Quarry is 4 bar.Discuss with LTS the relationship with Keld offtake.Keld offtake supplying Shap is currently feeding at 15 bar
31	Aberford	38 to 2 bar PRI	38	2	34.49	5	0	223	20	2	34.49	5	0		Expected Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
32	Kirkleatham	40 to 6.9 bar PRI	40	6.9	15.79	5	0	92	22	6.9	15.79	5	0		Expected Minimum	Greater than 0 degrees C	Maximum flow may be present at minimum pressure
33	Little Burdon	70 to 6.9 Offtake	70	6.9	52.00	5	0	710	38	6.9	52.00	5	0			Greater than 0 degrees C	Maximum flow may be present at minimum pressure
34	Crossgates	17 to 2 bar PRI	17	2	45.50	1	0	144	17	2	45.50	1	0			Greater than 0 degrees C	Maximum flow may be present at minimum pressure
35	Low Moor	17 to 2 bar PRI	17	2	45.00	5	0	61	17	2	45.00	5	0			Greater than 0 degrees C	Maximum flow may be present at minimum pressure

Ref	From	Comment	Resultant action	Comments / discussions since issue of Table 2
1	Design Co-ordinator, Major Projects	What risk does Ganstead pose to the network? Would it be better to put the LP Steam on it ?	The large HotCat site is a risk to the network regardless of where it is positioned due to the high potential electrical load it will pull. However, by putting it on Ganstead and leaving the heat exchanger in position we have left an option available for the network to replace the HotCat with a boilerhouse in the future without affecting the gas stream (other than by isolating the HotCat). This mitigates the risk.	-
2	E&I Engineer, Major Projects	There is no flow monitoring on the MP system at Cowpen therefore we should consider swapping Cowpen Bewley for Scremerston. Installing one would involve considerable pipe work modification and a supply isolation as there is no bypass system. Scremerston on the other hand is a relatively new installation with flow metering already in place and has good demand throughout the year.	The size of Scremerston is 169kW so it still sits perfectly within the 'small' criteria. This advice will be taken and the site recommendation swapped.	-
3	E&I Engineer, Major Projects	As you are proposing Tyresal for the medium boiler house site it would be worth considering one of the other sites on the Yorkshire 38-17 bar system with WBH's such as Dewsbury, Bullerthorpe, Lilley Lane, East Bierley for comparison purposes. These sites as they are operating at fixed pressure therefore flows are governed by system dynamics rather than externally controlled. Ideally we need to be looking at two offtakes with which feed into the same area such as Saltwick and Bishop Auckland flows can be swapped between sites to give a direct comparison of heating requirement for a known volume of gas.	This advice suits the project as the comparison in 'overall' energy used by more than one site can be compared readily with these two offtakes. Pannal will be swapped with Bishop Auckland.	Selecting Bishop Auckland and Saltwick for this feature does not consider the issue of the metering test facility at Bishop Auckland.
4	Programme Manager, Major Projects	For sites that interact and have the ability to have flows altered, offtakes are the best fit. Pannal & Towton are good examples.	See item 3. This comment backs up item 3 but we are aware that Bishop Auckland has had upgrades to the cabinets recently and so should, in theory, be relatively reliable.	The youngest WBH on the network is located at Pannal. If we were to monitor this site then we would be obtaining results from a large WBH and also a relatively young one.
5	Head of Investment Planning and Major Projects	Monitoring at Pannal will provide the additional benefit of being able to monitor the absolute latest WBH to be installed in the UK (2007). This will give us the ability to compare the latest WBH with the old ones and see if there have been any improvements of any note – something Fiorentini claimed when we put it in!	Ideally we would monitor the youngest WBH. However, this was not specified in the bid as a requirement. Although the results would be interesting Pannal does not represent the majority of assets on the network (whose age is generally above 25years old).	We will monitor the 'old' WBH's (small and medium sites) and the youngest one (large site) if we monitor Pannal. This will generate some potentially interesting results. Pannal may not represent typical WBH's but the small and medium sites will provide this information.
6	Head of Investment Planning and Major Projects	LTS Planning need to advise on two sites that interact in the manner set out within the NIC bid document.	See comment 3 above. AS discussed with LTS planning (including Jayne) regarding the fact that Bishop Auckland and Saltwick are modelled in the same way and as such have an identical flow rate. These two sites can be compared and monitored regarding combined carbon emissions.	From further discussions, and as mentioned in item 4, Towton and Pannal can be monitored in the way.
7	Support Engineer, System Control	When considering interaction at Pannal and Little Burdon we need to consider what sort of interaction we are seeking. Is it a physical interaction in gas supply structure terms or alternatively an interaction of site duty/heat requirement etc.	See comments above.	
8	Support Engineer, System Control	If Little Burdon and/or Wetheral are chosen and need to be running year round we will need to model how the system will run over winter and (more importantly) Summer and how we can configure things to accommodate this. LTS planning to be consulted on this issue.	After a very useful discussion with the LTS Planners including Martin Kew, Jayne Dawson and Ian Taylor, through manipulating the planning software it was considered that Little Burdon *could* possibly be kept live throughout the summer period by reducing the flows of gas through Durham Lane, Bluebell and Naisberry. However, how this affects Cowpen Bewley and Elton was not fully investigated and will require further consideration. The installation of LP Steam will still go ahead at Little Burdon.	

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9	Support Engineer, System Control	Comment as item 8	Keeping Wetheral live throughout summer was also investigated and was thought possible by decreasing the flow of gas through Low Thornley as both AGI's serve the same pipeline. However, this would have a knock on effect to the flow through Bishop Auckland due to this site being used for testing of metering. B.Hanley would provide further information on this.	The knock on effect from keeping Wetheral live and hence reducing flow through Bishop Auckland is not ideal for monitoring. However, the problem does not exist if we decide to use Pannal and Towton instead of Bishop Auckland and Saltwick.
10	Integrity Engineer - Metering and Gas Quality	Metering at Bishop Auckland.	The minimum required flow through Bishop Auckland was discussed with respect to how this would affect the interaction between Bishop Auckland and Saltwick. It was considered that although this metering requirement will need to be investigated further prior to adjusting the flows, a solution to change how the flows are 'booked' *could* be found to suit the NIC requirements. Currently the flow through Bishop Auckland is treated as a 'flat' number while the flow through Saltwick is treated as 'flex' to provide the make up of gas required to serve the area.	This problem of where exactly we can keep sites operational throughout summer is a problem on all sites. Flat and flex will need to be considered carefully whether Bishop Auckland & Saltwick or Pannal and Towton are chosen.
11	Project Manager, Specialist Technical Services	Bishop Auckland -v- Saltwick. Which should have new heating and which should have the existing equipment monitored?	Noting the possibility to provide new heating equipment to one site and to monitor the existing water bath heaters on the other, whilst also bearing in mind item 10, as Saltwick is a site owned solely by NGN (Bishop Auckland is part of an NG site), and both sites are likely to need increased electricity supplies, due to the aggressive NIC programme, it was thought that the build programme at Saltwick would be lower risk than at Bishop Auckland as it would be the responsibility entirely of NGN. As a result Saltwick will be selected as the site to upgrade the pre-heating on.	Should Pannal & Towton be selected Towton would have new large LP Steam equipment installing as Pannal had a new WBH in 2007.
12	Asset Inegrity Engineer, Asset	The panels at Saltwick are already installed and just need final connections.	Whilst Saltwick was not initially selected for a system upgrade, due to the new water bath heater cabinets, we must chose two sites where we can prove the concept that between them we can reduce the overall combined carbon emissions. From the comments above Saltwick and Bishop Auckland are ideal for this. Further to discussions with Matt Lyle, the cabinets recently installed are a generic design and could be re-used on another WBH site.	Saltwick was not originally selected, nor was Towton. However, should Towton be selected, there will be no new cabinets to be relocated as there would be at Saltwick. This seems to be a more sensible investment decision.
13	NIC Project Manager, Major Projects	Flows at Wetheral & Little Burdon during summer months needs to be considered.	Items 8 & 9 suggests that keeping the sites live through summer is possible with further investigation required. Should it be determined that the sites cannot be kept live, suitable learning will still be gained from peak season (winter) and mid-season (autumn and spring) results. Meaningful results will still be produced in line with the NIC proposal regardless of this risk.	-
14	NIC Project Manager, Major Projects	The interaction between Bishop Auckland & Saltwick will require careful consideration regarding minimum flow rates / flat & flex and metering.	These still appear to be the best two sites to 'interact'. As such, further work is required to look into exactly how this can be achieved.	Noting further discussion with the Asset team, it is believed that the better site selection would be Pannal - Towton as the metering issue at Bishop Auckland is avoided and the sites are not affected by whether or not Wetheral is kept live through summer (something which is desirable as Wetheral will be part of the NIC scheme).