nationalgrid

Project CLoCC

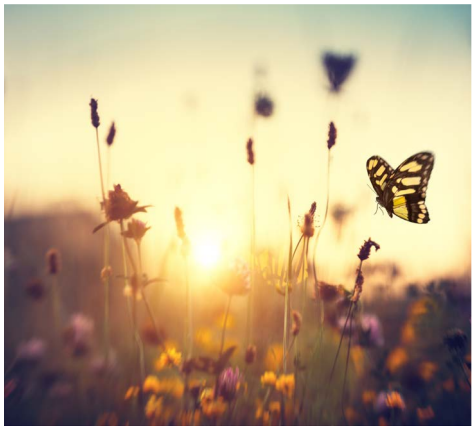
Close down report

Contents

1. Project background

Project CLoCC (Customer Low Cost Connections) aims to minimise the cost and time of gas connections to the National Transmission System (NTS), with particular focus on non-traditional NTS gas connections. This will be achieved through fundamentally challenging every aspect of the current connection process, building on worldwide 'best in class' technology and practice.

"Project CLoCC is listening to our customers. We aim to fundamentally challenge every aspect of National Grid's connection process – providing new connection options for the needs of our changing customer base to connect onto the National Transmission System."



2. Executive summary

"Gas plays a crucial role both today and in the future in supporting the UK's Clean Growth Strategy with Project CLoCC demonstrating National Grid's commitment to the work required to progress decarbonisation of transport, heat and power generation through the evolution of how the gas network can be used."

Andrew Malins, Head of Network Capability and Operations, Gas at National Grid

2.1 Project background

As a transmission high pressure gas pipeline operator, historically connections to the National Transmission System (NTS) were required to support typically large scale entry/exit connections, or to facilitate storage. Each connection request would be handled on a case by case bespoke basis with a Minimum Offtake Connection (MOC) at a greenfield site typically costing up to £2M and taking up to 2 years to deliver.

More recently however, customers have been approaching National Grid with a view to connecting smaller projects to the NTS. These are customers such as those developing non-traditional gas sources and requirements for these new customers are fundamentally different. Their projects are generally fast to market, often due to alignment with government renewable heat incentive funding or private financial investment. Furthermore, the associated cost for a connection represents a significant proportion of their total project development budget. This clearly highlighted the problem that currently connection costs and durations are prohibitive to new potential customers considering the high pressure network to support their project needs.

2.2 Scope of project

Project CLoCC was fully mobilised in February 2016 following receipt of its Ofgem Direction in December 2015 (Appendix A). During the project National Grid (NG) has partnered and been collaborating with three Small Medium Enterprises (SMEs) to develop new connection options for customers to connect onto the National Transmission System. has been collaborating with three Small Medium Enterprises (SMEs) to develop new connection options for customers to connect onto the National Transmission System.

The project's main aims were to consider how to reduce both the time and cost of connecting to the NTS by challenging every aspect of the current connection process and designing and developing solutions to support these goals further. The original project scope outlined that in order to consider the core objectives identified above 3 key areas would be focussed on in unison:

1. **Creating an online connections** platform to facilitate the customer experience. The goal of this workstream was to consider what elements of the current Application to Offer (A2O) process (a National Grid procedure specified within the Uniform Network Code) could be supported by development of an online gas customer connections portal and whatfunctionality would be most beneficial to potential future customers.

2. **Innovative physical connection solutions** tailored to the needs of non-traditional NTS gas connections at high pressure. This workstream was tasked with completing a global technology watch, developing conceptual designs and conducting field trials of the proposed engineering connection solution(s).

3. **Optimising commercial processes** to meet the requirements of non-traditional NTS gas customers. Considering areas such as payment terms, fees and contract optimisation.

Project CLoCC Core Objectives

- Reduce the cost of a connection onto the National Transmission System to less than £1M
- Reduce the time it takes from initial enquiry to "gas on" date to less than 1 year

National Grid has partnered with three UK based companies to deliver this project; Premtech Ltd, Murphy Group, and Aqua Consultants.

Premtech Limited are experts in providing engineering consultancy and design management services for onshore pipeline and installation projects of all sizes. UK based, Premtech have vast experience working with almost all the UK major Gas Distribution Network owners/operators. Premtech have also been instrumental in the successful delivery of a number of previous innovation projects for National Grid Gas Transmission.

Murphy Applied Engineering, part of Murphy Group, is an engineering consultancy with experience of taking engineering projects from the feasibility/conceptual stage through to the detailed design and build. Murphy have brought process design, fabrication, construction and commissioning experience in gas transmission and production to the project.

Aqua Consultants have developed the web-based customer connections platform in order to facilitate the customer experience. Aqua Consultants, in conjunction with the water utility companies, has been the sole consultant developing the software platforms for the water industry.

Project CLoCC Core Objectives - Outcomes

- Cost of a connection onto the National Transmission System now anticipated to cost less than £1M for standard design connections made to existing Above Ground Installations
- Time reduction from initial enquiry to "gas on" date now anticipated to be possible in less than 1 year for standard design connection application

2.3 Outcome of project

The project was setup to reduce the time and cost of connections to the NTS for an emerging potential customer base and has successfully demonstrated that this is achievable through development of a software platform, technical standard designs and commercial modifications. Each workstream has performed strongly during this project with numerous activities successfully completed and others further advanced in order to drive both time and costs down for connecting gas customers to the National Transmission System.

Quantitative demonstration of time and cost saving has been represented by considering the new standard design connection journey a customer follows – detail shown within chapter 4.

Time and cost savings achieved has led to a significant increase in interest from customers wishing to connect to the NTS and is confirmation that customers recognise that the network is now a viable option for them to consider. At the time of printing, National Grid have received interest from 12 different customers enquiring about 25 different potential connection sites. Four of these customers have confirmed that they will be applying to National Grid for a Standard Design connection as the innovation project is implemented. Historically, the National Grid connections team have dealt with approximately 10 project specific pre-connection requests over a twelve-month period, therefore an increase of 60% is notable.

Increased customer interest is further demonstrated through the successful onboarding of Project CLoCC's pilot customer, BioCow Ltd, whose Somerset Farm project in Cambridgeshire is expected to be the first direct biomethane gas connection to the NTS. Seeking a pilot customer was an additional, out of scope activity, that the CLoCC innovation team strongly felt would improve the maturity of project deliverables prior to handover of outputs to the National Grid business. This additional item is evidence of the project's transition from Technology Readiness Level (TRL) 4-6 to TRL 7-8 – further detail available within chapter 4.

In addition, interest has also been shown by other UK and European networks who may wish to apply similar methods to their own networks. Learning has been shared by CLoCC, through stakeholder engagement, in areas such as developing an online connection portal, creating standardised technical designs and the associated existing site database needed to pull these items together.

CLoCC has demonstrated that industry interest exists for utilising the NTS in new ways, and that the network can be "opened up" and made more accessible to our changing customer base. We do also recognise that complex industry conversations remain, which could not have practically been covered by this innovation project. All knowledge created by this innovation work will be handed to the National Grid business for further progression via our lessons learnt log (Appendix I).

1.
New gas connection application portal developed

2.
New "standard design" connection category created

3.
Improved commercial terms developed and implemented

2.4 Objectives successfully met

The main objectives of this project were to explore and implement solutions that would reduce the time and cost of connecting to the NTS. These objectives were tackled in a number of ways, a summary of which is shown below.

Activity successfully completed	Associated objective	
	Time reduction	Cost reduction
Development of gas customer connections portal to streamline Application to Offer process	**Yes** – replacement of paper based process by online method	**Yes** – reduced administration
New indicative cost estimate and mapping functionality – new to the connection process	**Yes** – instant customer information available	**Yes** – free upfront high level information for customers
Online status information, information transparency	**Yes** – information available on demand	**Yes** – reduced time to obtain information
Development of approved standardised connection designs in a variety of pipework sizes	**Yes** – designs ready "off the shelf" to support both conceptual design and detailed design project stages	**Yes** – majority of design work completed for MOC. Reduced site specific detailed design work required.
Technical guidance documentation	**Yes** – key information available in one place	**Yes** – a consistent approach to connections will minimise cost associated with risk and uncertainty.
Development of existing site database	**Yes** – all block valve, multi-junction and pig trap sites have been assessed for their suitability for a "Standard Design" connection	**Yes** – reduced site investigation work required

"A key activity to support reducing time and cost for our customers was the development of a suite of standard connection designs, in a variety of pipework sizes."
Robert Earl, Project Technical Lead

Activity successfully completed	Associated objective	
	Time reduction	Cost reduction
Development of pre-populated Conceptual Design Studies (CDS)	**Yes** – pre-populated Conceptual Design Studies created by the portal for NG to review and edit prior to releasing to customer	**Yes** – reduction in NG administrative efforts reduces activity time, and therefore cost
Detailed Design	**Yes** – already produced standardised designs reduces the amount of time required to complete detailed designs	**Yes** – already produced standardised designs reduces the amount of time, and associated costs, required to complete detailed designs
Enhancement designs for use by customer, on customer site.	**Yes** – potential to reduce customer design time	**Yes** – potential to reduce customer design costs
Uniform Network Code change 0627s (non-ROV)	**Yes** – significant reduction of materials required and a significant reduction of time required on site	**Yes** – reduced materials spend and time required on site
Uniform Network Code change 0628s (reduced route through PARCA if eligible	**Yes** – reduced timeline from 6 months to 3 months if capacity indication shows to be "green" within the connections portal	**Yes** – reduced fee if customer project shows to be suitable for the accelerated PARCA route
Uniform Network Code change 0629s (new connection category – Standard Design)	**Yes** – reduced timeline from 6 months to 3 months for standard design connections	**Yes** - reduced fee if project suitable for standard design connection
Gas quality – Gas Ten Year Statement updated (oxygen consideration)	N/A	**Yes** – potential savings in gas specification clean up required
Successfully built, installed and tested connection solution standard designs	**Yes** – time reduction lessons identified and fed back into generic design templates known as G/19 Gas Transmission documentation. **Note** - the equivalent documentation for the distribution network are known as G/17 & GL/5 technical standards.	**Yes** – cost reduction lessons identified and fed back into G/19 designs

2.5 Objectives not successfully met

During this project, each workstream widely considered options for customer time and cost saving. Ideas were generated through a global tech-watch, team workshops and industry engagement. An account of activities outlined in the original project scope which did not progress is detailed below, also detailed are time and cost saving ideas which the project team began to consider, but later chose to not progress further. Reasoning for all choices is summarised below.

Activity not successfully completed	Reason for outcome
Original scope – Enhanced connection solution within National Grid owned land	National Grid owning assets within own land legally deemed as anti-competitive
Original scope – Provision for multiple customers off a single connection	Commercially complicated to standardise this type of situation at this time due to the following factors: – If multiple inlets/outlets are required to the connection then the first connecting customer would be required to pay for valves and fittings to facilitate connecting a module for potentially a second customer, which may never materialise – If a single inlet/outlet is required to the connection supplying multiple end users then the NG validation activities will be different from standard validation activities due to the requirement to validate multiple end users. Designs created by the project do allow for a second customer to connect at an already connected side (assuming there is available space) by modifying pipework at the time of the second connection. This type of situation is to be managed on a case by case basis by National Grid and in agreement with all relevant stakeholders involved.
Additional idea – Utilisation of renewable kiosk innovation	Renewable kiosk found to be underpowered due to software upgrades made in connection with site security. National Grid continues to review this opportunity outside of Project CLoCC.
Additional idea – Alternative solution to the requirement for 20D* gas quality sampling	Difficult to standardise solution as many customer specific variables exist. Solution remains project specific as subject to assessment.
Additional idea – Inclusion of blending facilities	Out of scope for this project. Discussion continues by National Grid within RIIO T2 activities.
Additional idea – New licence point process implemented	Positive progress on this item with Ofgem. Activity continues to be progressed by National Grid business as usual teams. Expected implementation 2019.
Use of industry standard pipe and fittings	The benefit of moving away from higher specification National Grid standards for materials did not outweigh the challenges of getting standards and policies changed at this time. Replacement specifications are still required to properly order materials. National Grid continues to review this potential future opportunity. Note – Industry standard pipe was used within the build element of this project under a deviation from National Grid
Installation at customer pilot site	This work continues past the close of Project CLoCC, supported by National Grid business as usual teams and in line with customer requirements.

* To ensure gas safety and monitoring compliance gas entering the network must currently be sampled at 20 x pipe diameters up and downstream from an injection point.

2.6 Main learning generated

Learning and opportunities generated throughout the project have been categorised and summarised below.

Gas customer connections portal generated learning:

- Value of upfront information for customers – new indicative cost estimate functionality provides free and rapid high level information to customers.
- Flexible information accessibility – 24/7 access to customer's own connections portal account in order to check and track application progress.
- Mapping functionality – available via the connections portal allowing easy illustration of project viability.
- Simplified visualisation – demonstrated through user-friendly design of connections portal (e.g. gas quality "copy" functionality for multi-year data input).

Technical workstream

- Value of standardised designs – cost and time savings possible for both conceptual and detailed design phases of the connections process.
- Procurement constraints – specifying equipment to allow competitive procurement minimises costs but reduces the ability to fully standardise design.
- Gas quality measurement requirements – the requirements for gas quality sampling on the NTS at entry points and potential alternatives acceptable to National Grid are now fully understood. This learning is available by reviewing the projects technical guidance document which is accessible via the connections portal.
- Functionality of the Remotely Operable Valve (ROV) – the required functionality of the minimum connection isolation valve or "ROV" prompted further investigation. Clarity was obtained through development of the project.
- Improved understanding of enhancement opportunity – enhancements were considered from a design, supply, install, own and operate point of view. Having identified the anti-competitive issues associated with National Grid supplying 3rd party metering resulted in the project only developing designs for filters and meter systems.
- Improved understanding of renewable kiosk opportunity – the renewable kiosk when operating with the new telemetry systems did not have sufficient stored power. It was therefore unavailable to utilise in the CLoCC kiosk design at this time pending further development.
- Improved understanding of the G19 approval process – the additional time and engagement of National Grid subject matter experts to obtain approval for the project's standard designs is now more widely understood.
- National Grid specification compliance – National Grid specifications were adhered to and deviations requested and approved enabling use of industry standard pipe. At this time it is anticipated that deviations will continue to be required due to the small quantities of pipe being ordered, should this change in the future National Grid my choose to review current policy.
- Procurement – the project experienced very late delivery of materials from some vendors. It is recommended, once customer appetite is clearly understood, that National Grid consider pre-building the connection modules and telemetry kiosk so that they are "on-the-shelf" ready for issue to customers. Pre-purchase of long lead items is also recommended, a concept which is already being considered by the National Grid business.
- Time to build – the outturn build programme was logged and fed back into the programme cost estimates for the portal.
- Testing and commissioning – testing and commissioning of the connection solution was carried out with National Grid sub-contractors, Vodafone. Learning regarding this process has been fed back into the costs and programmes which will be available in the new connections portal.
- Outturn costs – outturn costs for the build have been captured and fed back into the cost estimates that have been built into the new connections portal.

Commercial workstream

- Value of process alignment – awareness that for some customers improved alignment between capacity reservation through PARCA and the connection processes, although separate processes, is valuable.
- Reduced upfront fees – support improved funding and cash flow opportunities for some customers.
- Staggered UNC implementation – enabling benefits of commercial changes to be utilised early where possible.
- Gas quality specification blockers – understanding that different customers experience differing blockers from National Grid's Gas Ten Year Statement and offering as much flexibility as possible is valuable.
- Early engagement – engagement with key internal and external stakeholders is essential to implementation success.

- Value of fast track options – understanding where processes can be fast tracked, the limitations to this, and how this can benefit some customers.
- Pilot customer – working with our pilot customer directly to more widely understand their opinion of our standard design commercial terms supported revision where possible.

2.7 Main learning derived from method

Innovation projects inherently experience challenges and risks that would not be associated with business as usual activities. For this project a number of challenges arose from the original setup and methods adopted, considerable learning has been achieved in these areas. Learning generated from the methods adopted is summarised below and further detailed in chapter 9.

- Value of prototyping – a demonstration version of the connection portal was not originally scoped into the project but has proved invaluable in supporting stakeholder engagement and project team decision making.
- Order of scheduled activities – rework challenges faced in creating a software portal in unison with other workstreams, delayed start for software development would have been beneficial.
- Clear deployment/implementation goals – ambiguous understanding of whether or not innovation deliverables would be implementation ready at the start creates challenges for business as usual preparation. Early prototyping and staggered business implementation would be advised.
- Website dissemination – invaluable tool for efficient dissemination. Essential this communications method is setup prior to project start.
- Importance of engagement – early and continued engagement essential for all project stakeholders, internal and external. Clear engagement plan and dedicated resourcing to maintain and monitor activities is valuable.
- Supporting project tools – virtual project management tooling valuable when working with remote team members. Such tools help to improve efficiency and increases the ability for the team to collaborate.
- Naturally collaborative team – innovation projects are challenging and securing a team of collaborative and positive members increases the likelihood of a successful innovation outcome, whether that means failing fast against items or succeeding against all original activities set.
- Staying within project scope – clear and efficient communication to the business/project team when items raised may fall into “scope creep”. Clear identification of change requests and strong project management of change control is essential.

3. Details of work carried out

This chapter details the work carried out by the gas connections portal workstream, technical workstream and commercial workstream of this innovation project.

3.1 Gas customer connections portal – work carried out

The development of the new gas connections portal was split into two separate sections – a customer facing portal and an internal administration portal.

The customer portal is a public-facing website which allows new customers to make connection applications, submit supporting documents and receive information from National Grid regarding the application process.

The administration portal is an internal website, available only to National Grid employees, which provides functionality to receive, manage and process the applications made by customers through the customer portal.

3.1.1 Development of customer facing gas connections portal

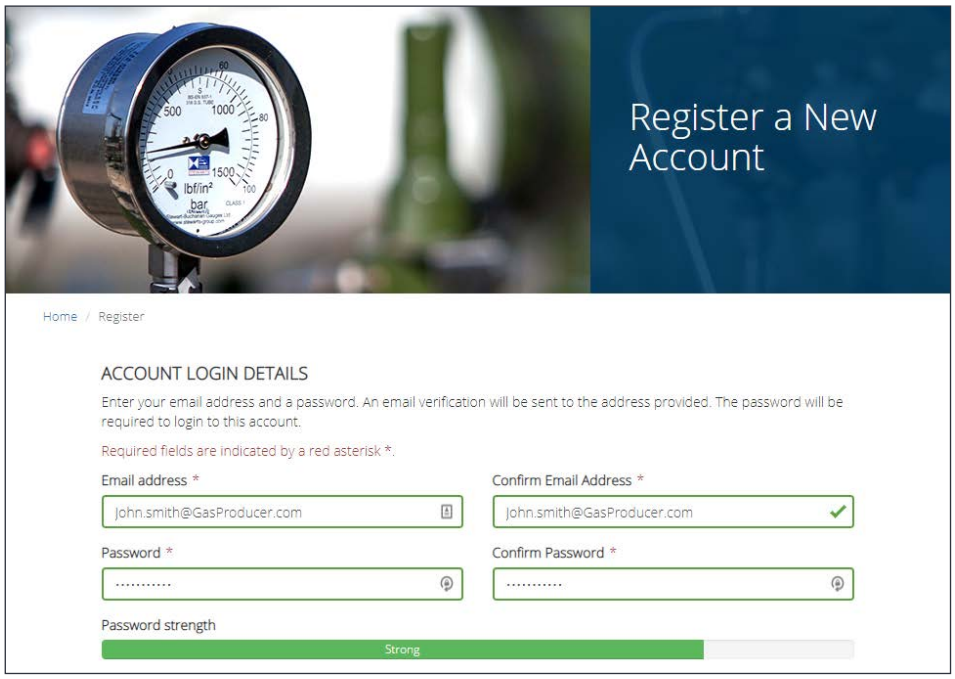
The aim of the customer-facing portal was to replace the existing paper-based connection application process with a modern web-based system that would support the new standard design connection applications, as well as bespoke connection applications.

In addition, the portal was required to automatically identify suitable sites for potential standard design connections and generate instant cost estimates for these connections.

Planning and Advance Reservation of Capacity Agreement (PARCA) applications were added as an additional requirement of the connections portal as development progressed. This would enable customers to obtain an offer for reservation of capacity in a similar time-line to that of a connection offer. By seeking to align these two activities customers are now able to track both types of application in a single place.

Overall, the key requirements of the customer portal were:

- Allow customers to register on the system in order to make applications
- Allow customers to generate cost estimates and identify sites for potential standard design connections
  - Standard design connections
  - Bespoke requests (including connection, modification and disconnection applications)
  - PARCA reservations
- Provide a mechanism for customers to track the progress of their applications
- Provide a mechanism for customers to receive and download connection offer documents
- Provide a mechanism for customers to accept connection offers



The picture above shows the top section of the customer registration screen

Customer registration

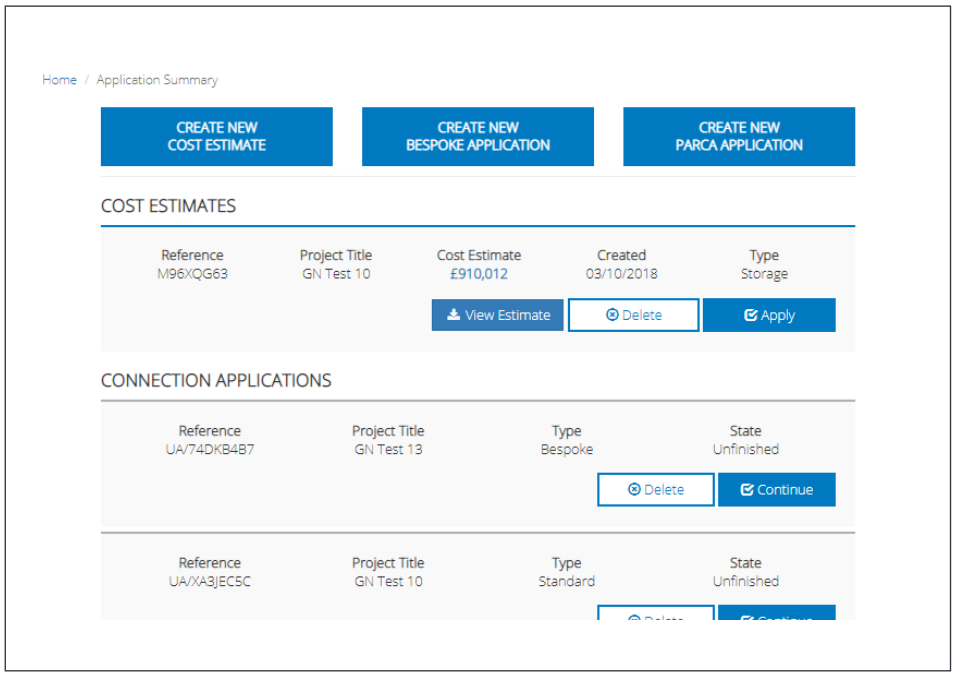
To control access to the application, a registration system was created. This allows new customers to register their company and their contact details, and create a user-name and password. The registration process was designed to make access to the system easy and convenient for customers, while keeping maintenance overheads for National Grid to a minimum and maintaining an appropriate level of security and traceability.

An email validation process was created to minimise misuse of the system and prevent automated “web robots” from creating multiple accounts. Additionally, for registered companies, a further automatic check was implemented to verify their details against Companies House to ensure the company is valid, and to automatically retrieve company information for use in the system.

To further minimise misuse of the system, each account is provided with a limited number of cost estimate requests, initially this has been set to XX.

When a new user request is submitted within the connections portal National Grid will conduct a request validation and either approve/reject the account. If approved, a confirmation email will be issued to the user. If rejected, the user will be contacted by National Grid where more information may be required to progress the request.

To minimise the administration workload for National Grid, once the first user for a new company is registered and validated by National Grid, that user will be the designated administrator for their company and will perform the verification of all subsequent new users from that company. Hence, companies self-validate their own new users without needing National Grid’s involvement.



The picture above shows the top section of the customer dashboard screen

Customer dashboard

A customer dashboard screen was created which displays a history of all cost estimates and applications made by a customer's company.

This screen has been specifically designed to promote collaboration by the registered users at each company including information availability and transparency about an application's status. On this screen, users can see all cost estimates and connection applications for their entire company. This allows a team of users to update and maintain the company's applications, while being potentially geographically separate from each other.

Existing site database and cost database

In order for the system to generate instant cost estimates, it was necessary to create a database of all existing AGI sites. This database would record the facilities, capacity and connection capabilities of each site, along with location and postcode and numerous other items of information.

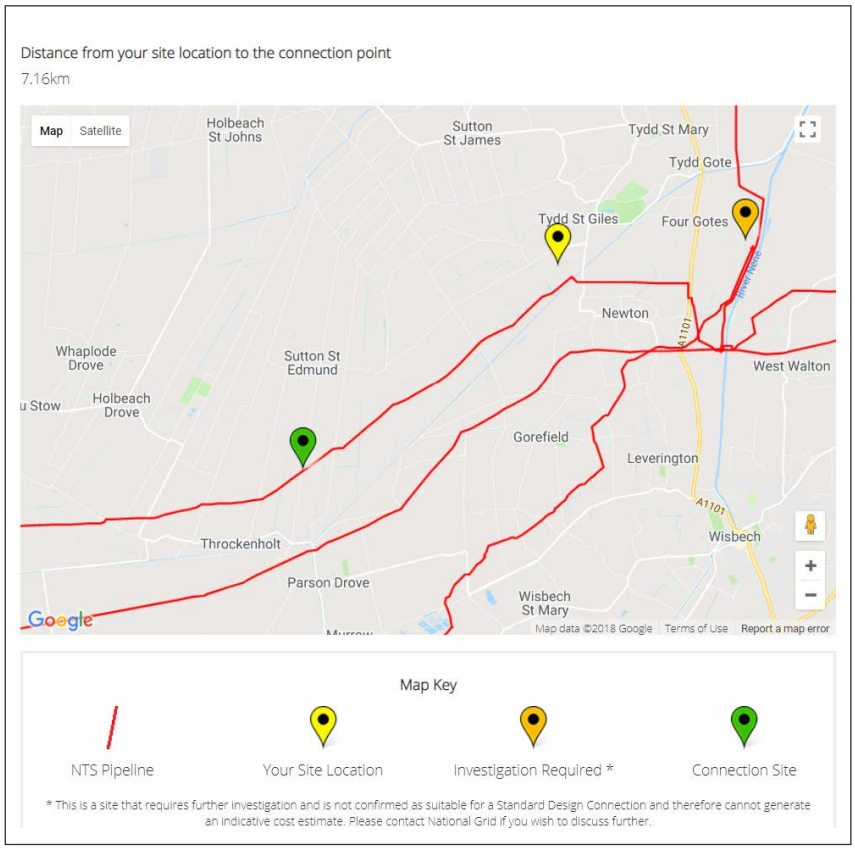
To do this, the project team undertook a detailed review and analysis of every National Grid AGI site, and meticulously recorded all necessary attributes of each site.

In total, 526 sites were recorded, with each site having 117 data values associated with it, making a total of over 61,000 data values.

A key set of data for each site was the sites ability to accommodate the various standard design connections developed by the project's technical workstream. For each design, an assessment was made as to whether; the site could contain the connection with no extension to the site, the site could contain the connection if a small extension was built, or, the site could contain the connection if a large extension was built.

For each combination of connection design and extension requirement, an expected price was established for the works, materials and equipment that would be needed to create the connection. This information is stored in a cost database.

With the existing site database and the cost database in place, it was then possible to establish an approximate cost for any standard design connection type at any assessed site.



The picture above shows the display of a potential connection site, derived from the customer's basic parameters

Map and postcode look-up

In order for the system to automatically identify suitable connection sites, it was necessary to create a system that would allow the user to enter a postcode, and convert this to a pair of GPS coordinates. Once converted to GPS coordinates, the system could then use the existing site database to establish which sites were closest, and which of these are capable of accommodating the connection requirements of the customer.

To assist the user, a mapping system was devised, based on Google Maps, which plots the existing NG transmission network, the location of the customer site and the potential connection sites directly onto the UK map. This provides an instant visual indication of the potential connection locations.

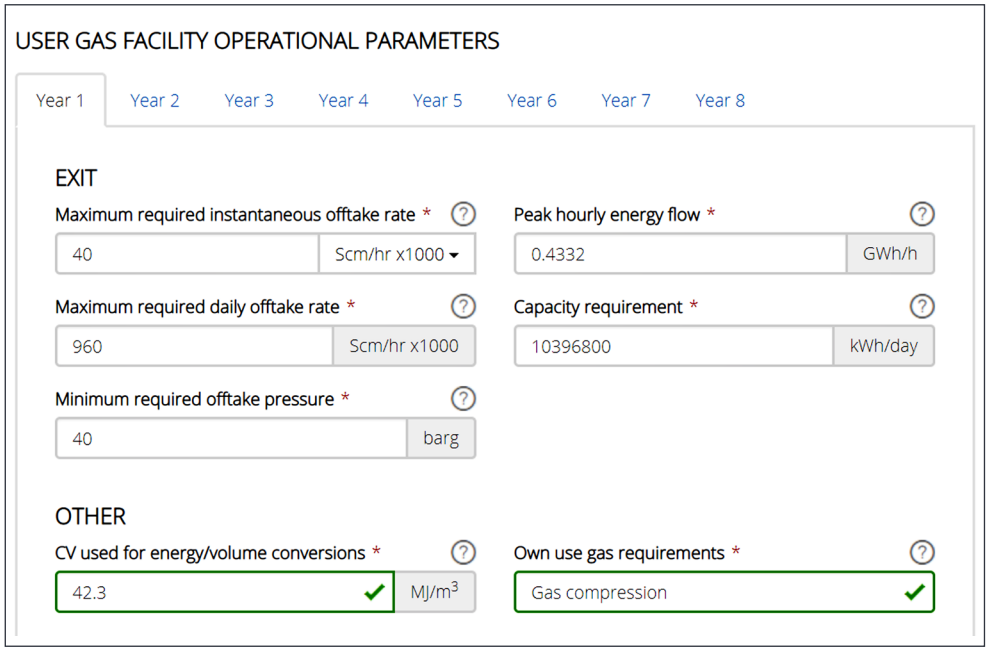
A facility was also provided to allow customers to visually move the proposed connection position to a non-AGI location on the map.

Cost estimation and site identification

A series of screens were created to allow the customer to enter the basic parameters required to generate a cost estimate. These include the postcode, the type of connection and the gas requirements for that connection type.

The system is designed to ensure the input fields on the screens automatically change to match the type of connection required by the customer, thus minimising input effort.

A mechanism to name and save the cost estimate within the customer's account was also implemented.



The picture above shows a section of the application details screen for a standard design connection

Application screens

Connection application screens were created for standard design connections, bespoke requests (including connection, modification and disconnection applications) and capacity reservations (PARCA).

In the case of bespoke applications and PARCA applications, the fields on the screen were created to match the information currently requested on the existing paper-based application forms.

For the standard design connection application, the screens were designed around the requirements for these new types of connections.

To retain simplicity of use, the data entry fields for each application were grouped into logical sections, and with each section having its own screen. The system was designed to allow the user to navigate forwards and backwards between each screen while entering the required data.

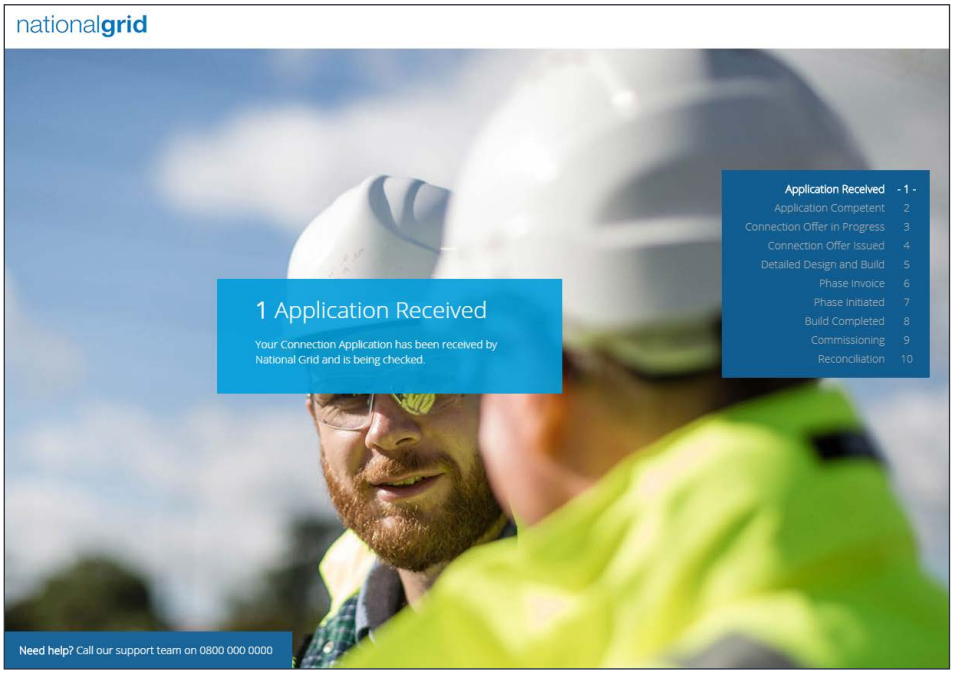
All of the key fields have been given “tool-tips” to provide users with guidance to assist the entering of the information. Where possible, fields are automatically validated to prevent users from entering invalid data.

Mandatory fields are enforced by stopping the user navigating to the next screen if any required data is missing.

Capacity indication

The system was required to indicate capacity availability for potential connection sites. A mechanism was created to automatically deduce the capacity availability based upon the user-entered connection parameters and the capacity information stored within the internally facing administration portal.

An on-screen indicator was created to show the user if the capacity of a given site is sufficient to accommodate their required delivery parameters, or if further investigation is required to establish what can be accommodated.



The picture above shows an example Customer Journey screen that would be seen by a user on the customer portal

Customer notification

A key requirement of the portal was to enable the customer to track applications. Two modules were created – a customer journey screen and an email system to notify customers of the progress of their application.

The email system was designed to generate emails based on a pre-defined template, to notify users that an application has moved to the next stage. A link was built into the email text allowing the user to connect directly to the application portal and view the new status of the application.

To view the status of the application a “Customer Journey” screen was created for each application type (standard connection, bespoke request and PARCA). The specific screen layout was contracted to a third party and the design then incorporated into the customer portal.

The picture above shows an example Customer Journey screen that would be seen by a user on the customer portal. Users are now able to view the status of each application, instantly, via the portal.

Offer information

The final stage of the portal is to provide the customer with electronic copies of a connection offer. A facility was created on the customer screen to allow the download of all files relating to their application and connection.

In addition, an upload facility was created to allow the customer to upload a signed copy of their connection offer and submit it to National Grid.

3.1.2 Development of National Grid facing administration portal

To manage the information being submitted from, or sent to, the customer portal, it was necessary to create an administration portal. This would allow National Grid employees to view submitted applications, progress and record application activities and notify the customer of application progress.

Overall, the key requirements of the administrator portal were to allow National Grid staff to:

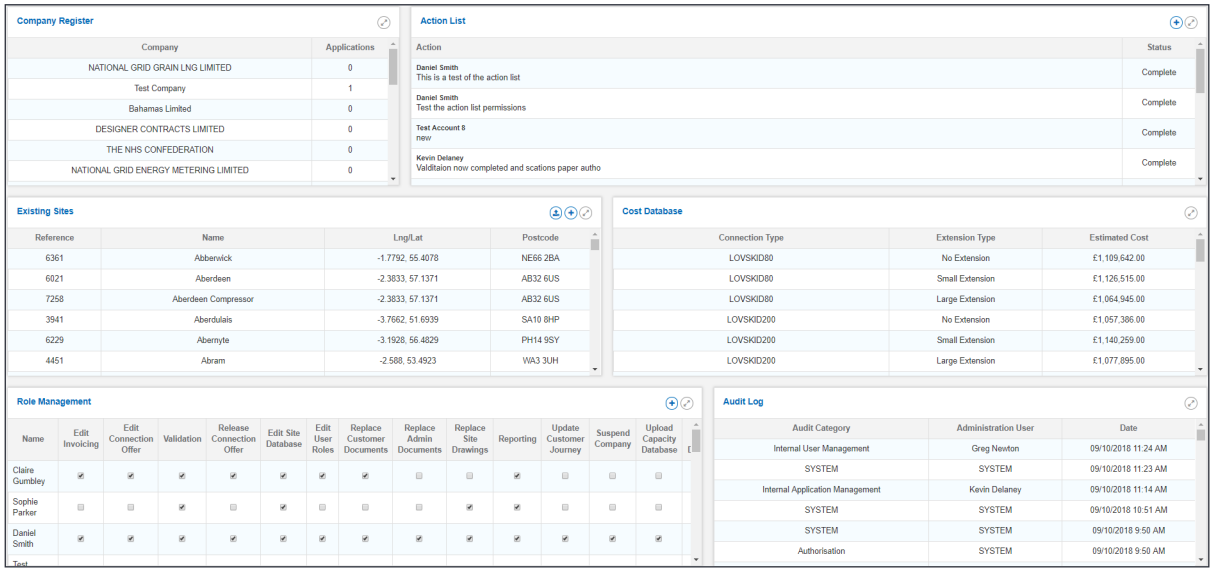
- Be notified via email of new applications made in the portal
- View the applications, both geographically and in list format
- Collaboratively process the application to develop an offer pack
- Upload files relating to applications and other areas of the system
- Allow the update of application status in a customer journey
- Automatically generate key files forming the offer pack
- Send a connection offer pack to the customer
- Monitor, suspend/re-instate or delete registered customers
- View and update data in the existing site database
- View and update network capacity information
- Raise and track invoices
- Create reports of key information relating to applications, users and invoices
- View user activity in a log

Registration

Since the administration portal was only to be accessed by National Grid employees, it was decided that a self-registration screen would be undesirable, as this would present a significant security risk to the system.

Instead, the system was designed to require existing National Grid employees to create new accounts for additional employees, and specify the email address and role details. Since the number of employees accessing the system will be relatively low, the overhead of creating new accounts was deemed acceptable.

To control access to critical functions, a user access feature was created allowing a “super-user” to specify the functions available to each staff member. Thus, specific functionality can be allocated to users in accordance with their NG job role in the application management process.



The picture above shows a section of the administrator dashboard screen

Dashboard screen

To facilitate navigation around the various administrative tasks, a dashboard screen was created. This comprises a series of panels, each relating to a specific administration activity. These include:

- Company Register – for viewing and managing registered companies and users
- Application Register – for viewing and managing customer applications
- Existing Sites – for viewing and updating existing site information
- Cost Database – for viewing and updating standard connection costs
- Audit Log – for viewing administrator activity on the system
- Actions – for logging and tracking internal National Grid actions
- Invoices – for raising and tracking invoices

Each panel initially shows a summary of the information contained within that functional section. This can be expanded to show a detailed breakdown of the information and to provide additional functions for the administrator to access.

In addition to the on-screen panels, functions have been provided to allow reports to be exported from the system. These reports include:

- Application Report – showing a history of applications and progression dates
- Companies Report – showing details of registered companies
- Actions Report – showing details of recorded National Grid actions
- Invoices – showing details of raised and paid invoices

A mapping facility was also created that shows the submitted customer applications overlaid as markers on a UK map. Clicking on a marker allows an administrator to directly access the details of the application.

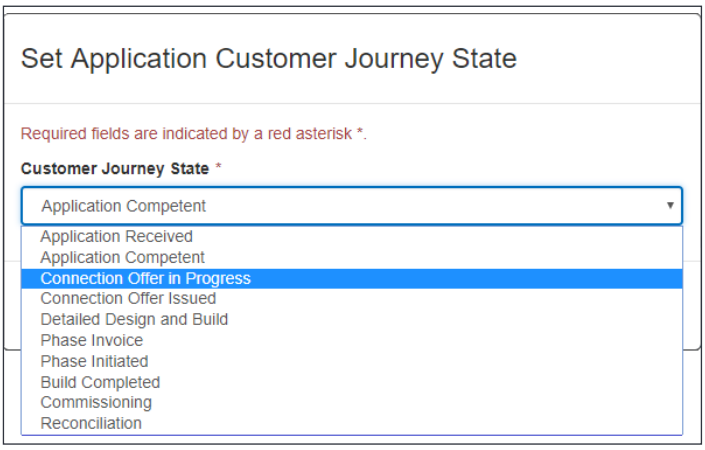
To enable collaborative working, the dashboard screen is made available to all registered National Grid staff. This allows staff members to work on any given application and any uploaded documentation. Information is immediately available to other staff members without needing to be geographically co-located.

In National Grid's case, there will be two main teams processing the applications (a technical team and a commercial team). The design of the dashboard and administrator portal ensures that collaborative working is straight-forward and convenient across the National Grid business.

File manager

This allows the upload of any necessary file into the system, including connection design documents, NG site drawings and 20D drawings which relate to gas quality sampling points to ensure the NTS is GS(M)R compliant. A risk assessment will determine whether one or two sampling points are required.

A mechanism was created to allow uploaded files to be linked to a specific site, or a specific connection offer. Uploaded files are stored in the database and can be retrieved by anyone else registered as an administrator in the system.



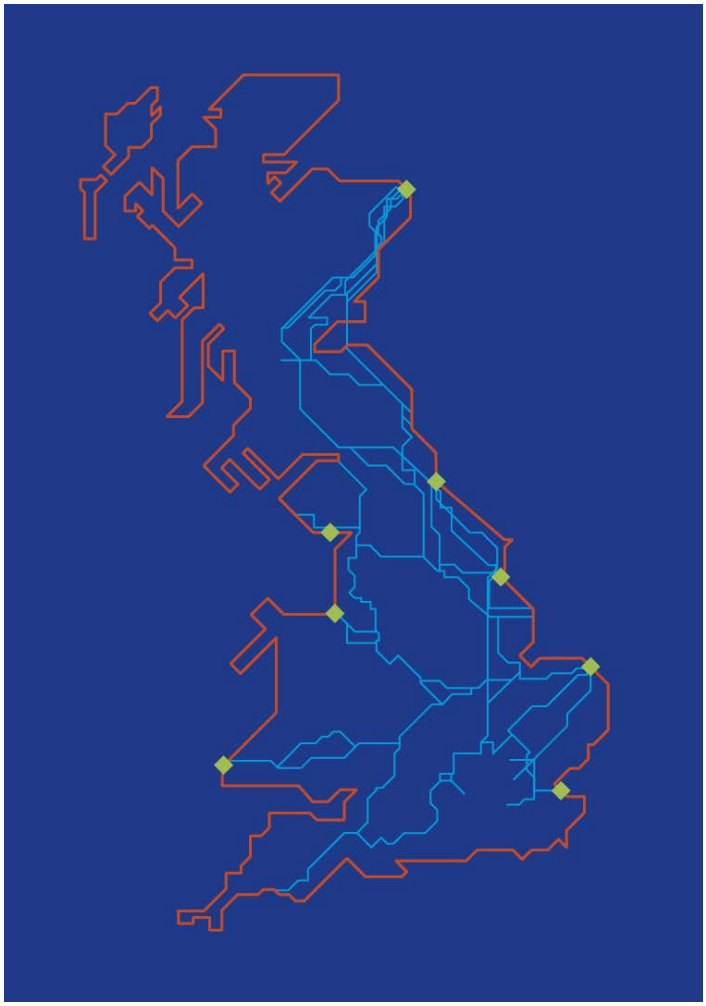
The picture above shows the customer journey status screen

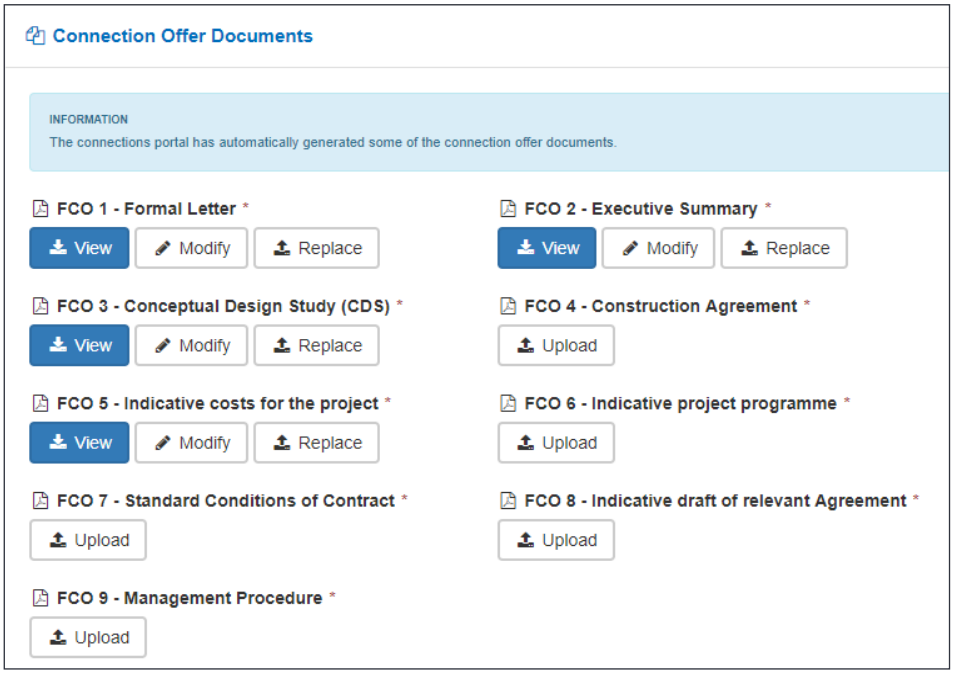
Customer journey

To enable National Grid to notify users of updates to their applications, a facility is provided to allow staff to specify the current status of any application. This is provided in the form of a drop-down box listing the available statuses for any given application type.

To enable customers to be notified of the new status, an email mechanism was developed that sends an email to all customers registered for the company submitting the application.

Upon the application status being changed, the system automatically sends an email to the relevant registered users, notifying them of the change.





The picture above shows the offer documents editing section of the administrator portal

Automatic generation of connection offer packs

To speed up the connection design process, the system was designed to automatically create connection offer documents.

Standard notification letter templates are stored in the system and are automatically pre-populated with customer details ready for sending. A “what you see is what you get” text editor enables the letters to be customised for specific customers or circumstances. On completion, the letters are automatically uploaded into a placeholder ready for NG to release to the customer.

Connection design documents are also generated automatically. To do this, the system makes use of the design and site information documents, including drawing documents that have been uploaded through the File Manager. An offer creation module was created that selects the appropriate site and design documents that match with the parameters entered by the customer in the application. The details in the documents are automatically merged together to make a connection offer document that is automatically added to the offer pack and ready to be sent to the customer.

The automatic generation of the Conceptual Design Study document provides a considerable saving of time over the previous process of manually creating every design document from scratch.

In total, four key documents are automatically generated or pre-populated – this significantly speeds up the processing of applications.

Note that the items with blue “view” buttons have been generated automatically by the system. The largest time saving is in automatic creation of the Conceptual Design Study document.

The system stores all newly-created documents in the portal, ready to be released to the customer when the National Grid verification process is complete. Note that National Grid have editability of documents generated by the system if required

Existing site database

As described in the above sections, an “Existing Site” database containing details of all existing National Grid AGI sites was created. This is an “evolving” database that will change over time and as customers make use of the system to register applications.

Thus, it was necessary to create a mechanism to update all data in the Existing Site database via the administration portal.

A panel in the administrator dashboard was created that allows administrators to view and update any individual data element in the existing site database. Data that can be updated includes:

- Site details (e.g. name, location)
- Technical parameters (e.g. installation type, telemetry, feeder size)
- Drawings (e.g. ELD (Engineering Line Diagram), HA (Hazardous Area), GA (General Arrangement), 20D (20 Diameter Gas Quality monitoring point drawing))
- Connection capability (e.g. skid type, capacity availability)

Drawings are uploaded as PDF files and used in the generation of the design packs relating to that site.

Cost database

A cost database was created to store the approximate costs of any standard connection type. To maintain this database, a panel was developed in the administrator dashboard that allows the viewing, adding and update of data, specifically:

- Connection modules available at each site
- Costs for:
  – Materials
  – Detailed Design
  – Main Works Contractor – Build and Commissioning
  – Staff Costs
  – Project Services

The costs in this database are used to generate the cost estimates for the customer facing portal.

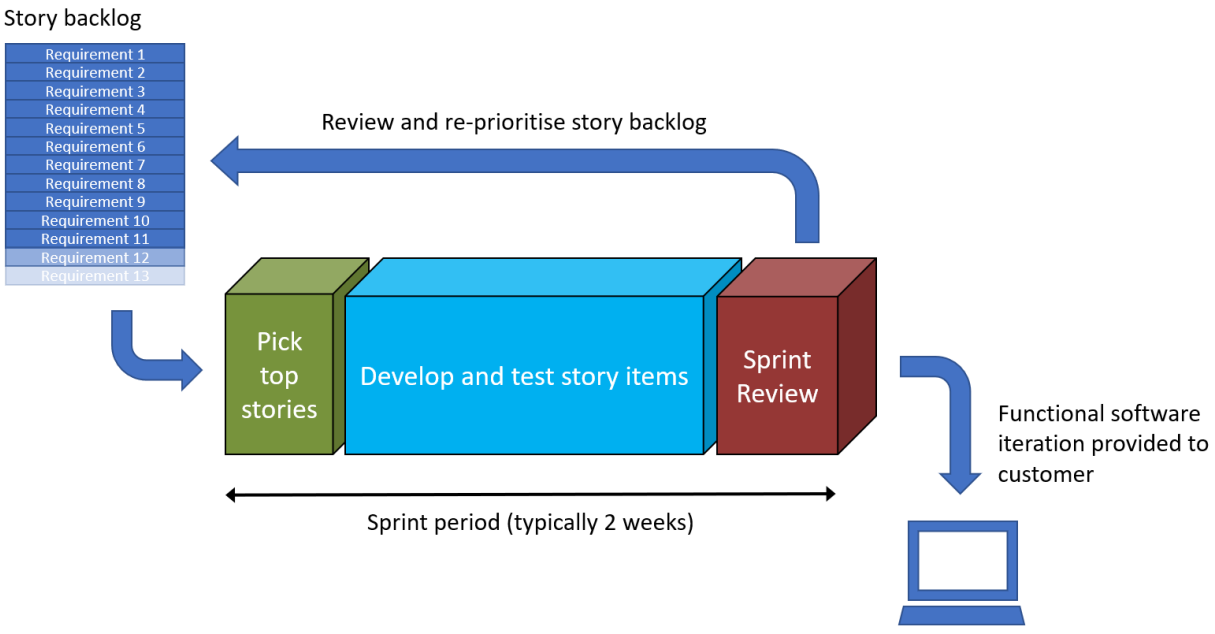
3.1.3 Development methodology

Since there was a high degree of innovation in the overall CLoCC project, it was likely that the initially documented requirements for the portal would change during the progression of the project. It was decided therefore that the development of the portal would be performed using an Agile methodology.

A "Scrum" process was implemented. This involved the following iterative process:

1. A complete list of initial requirements was specified at a high level (i.e. low-detail), and stored in a "story backlog".
2. The requirements were prioritised with highest priority at the top.
3. The top group of requirements were developed into a high degree of detail.
4. A set of the top group of detailed requirements were planned into a short time-boxed period (typically two weeks), called a "sprint".
5. The sprint was executed.
6. Following the sprint, the resultant, partially completed, system (called a "software iteration") was reviewed by National Grid and the requirements re-assessed and re-prioritised. In some instances, new requirements were identified, and some existing requirements were dropped.
7. Steps 3 to 6 were then repeated for the duration of the project.

This process can be visualised as follows:



This methodology enabled the project to progress with a high degree of flexibility in the requirements, without slowing the project due to the multiplicity of change requests.

At the end of each sprint (or for practical purposes, typically after every second sprint), a release of the system was made available to National Grid for review and testing. This allowed National Grid to have a regular view of the system as it progressed which allowed the opportunity for regular feedback and approval or redirection of the development path.

This ensured that the requirements were being met as the project progressed, rather than waiting for the development to be completed before the system became visible to National Grid.

Additionally, this provided the opportunity for National Grid testing to be performed throughout the duration of the development, meaning significant bugs and functionality issues could be identified and addressed early, rather than discovering a backlog of bugs at the end of the project.

Further information about the gas connections portal workstream can be found in Appendix D.

3.2 Technical workstream – work carried out

Standard designs available for gas flow rates up to

57.3 gwh/d

The technical scope of the project included development of detailed designs which were to be pre-approved and pre-appraised. This work was completed within stage three of the project alongside obtaining National Grid subject matter expert (SME) acceptance of the designs as standard G19 designs, following National Grid procedure T/PM/G/19. Due to updates to the designs the acceptance of the designs by National Grid SMEs is ongoing as a business as usual activity. Premtech Ltd have developed detailed designs for a number of modules which are grouped into 6 standard design packs as shown in the adjacent table:

3.2.1 Development of standard connection designs

Full MOC with Skiosk connected to a 200mm block valve bridle

Design modules	Size	G19 Pack
Remotely Operable Valve (ROV) connection modules	200mm Nominal Bore (NB), 300mm NB	G19/23
Locally Operated Valve (LOV) connection modules	80mm NB, 200mm NB, 300mm NB	G19/23
Skiosk (see page 24)	80mm NB	G19/25
Telemetry kiosk	Universal for all connections	G19/26
Interconnecting pipework for use with ROV/LOV modules or Skiosk	300mm x 300mm, 300mm x 200mm, 300mm x 80mm, 200mm x 200mm, 200mm x 80mm	G19/24
Simplified exit connections	300mm x 300mm, 300mm x 200mm, 300mm x 80mm, 200mm x 200mm, 200mm x 80mm	G19/24
Filter modules	80mm NB, 200mm NB	G19/27
Meter modules	80mm NB, 200mm NB, 300mm NB	G19/28

All designs listed are available as free-issue designs upon request. Please contact National Grid using the details provided in chapter 15 to make a request.

Skiosk design – combined MOC and telemetry kiosk

Development of SKiosk design

In order to maximise the number of opportunities to connect a gas customer within an existing NG asset site (a cost and time saving approach identified within stage 1 of the project), the footprint of the technical designs created by the project have been minimised as much as possible. This is particularly noticeable with the combined Remotely Operated Valve (ROV) and Kiosk design, known as our 'Skiosk' connection solution. Here, the pipework that forms part of the minimum connection has been mounted onto the side of the telemetry kiosk.

By doing this, the need to have two separate 'modules' for the ROV and telemetry kiosk is removed. A single and complete connection unit directly benefits some sites which have a limited amount of available space within the existing NG fence line. By combining the ROV and kiosk it is more likely to fit within existing NG land ownership negating the need to extend the site, which could involve planning permission. This inherently has time and cost savings for the customer.

Combining the ROV and kiosk also means that only one civil base is required. As such, there will be a reduced amount of concrete and site excavation needed, which gives the 'Skiosk' environmental benefits over the standard arrangement of a separate minimum offtake unit and telemetry kiosk.

The extent of factory testing is also greatly increased by the SKiosk design which in turn helps to reduce construction costs. All wiring from the field equipment, pressure transmitters and ROV, can be completed and tested within the fabrication factory prior to site installation. This helps to reduce the amount of time spent site testing.

DNV-GL have undertaken a risk assessment in accordance with T/SP/G/37 to demonstrate that having connection pipework mounted on the side of the telemetry kiosk is acceptable. This risk assessment formed part of the technical deviation that was requested by the project. The deviation was accepted by National Grid based on the outcome of the risk assessment from DNV GL which stated that there is no increased safety risk due to the mounting of the pipework on the telemetry kiosk.

Typically, National Grid telemetry kiosks are made from Glass Reinforced Plastic (GRP). Based on the projects intention to combine the telemetry kiosk and ROV module, the project needed a telemetry kiosk that was of sturdier construction. As such, it was decided that a used ISO shipping container would offer the rigidity needed to make the 'Skiosk' design work. This has environmental benefits as shipping containers are often single use items as it is uneconomical to return them to the origin of manufacture, typically in Asia.

The kiosk design includes a new personal door in place of the existing double cargo doors and iron works on the outside to enable mounting of a satellite dish pole, vent system and pipework.

The telemetry kiosk has been fitted with a passive vent system instead of the typical temperature control systems found within National Grid telemetry housings (e.g. dehumidifier, air conditioning unit). This has further environmental benefits as the kiosk will require a smaller electrical load. The passive vent system uses the buoyancy and movement of air to effect a nominal air change every hour.

To ensure the kiosk is well insulated, the inside is lined with a foam spray which will then be topped with a spray on rubber coating.

Skiosk design - combined MOC and telemetry kiosk

Removal of ROV from exit connections

When any new gas connection is made to the NTS, National Grid currently specifies that a Remotely Operable Valve (ROV) should be included. On a typical entry connection, National Grid has the ability to close the valve remotely. The customer can also request that the ROV be closed remotely via National Grid. However, only National Grid can open the valve and this operation is carried out locally. The typical reasons for needing to close the ROV would be that the customer's gas is out of specification compared against the Gas Safety (Management) Regulations; requiring that the valve is shut to prevent out of specification gas reaching the NTS, and potentially breaching National Grid's safety case.

During the project, the need for a Remotely Operated Valve on exit connections has been challenged as it was risk assessed that an isolation valve that could be closed locally, would be sufficient to provide isolation.

A senior management forum within National Grid gave its approval for the removal for the absolute requirement for a ROV on new exit connection following successful completion of a risk assessment.

Development of simplified exit connection

Once the project established that it was practical to remove the absolute requirement for a ROV on new exit connections, the project looked to develop a design that would allow customers to take advantage of this new opportunity.

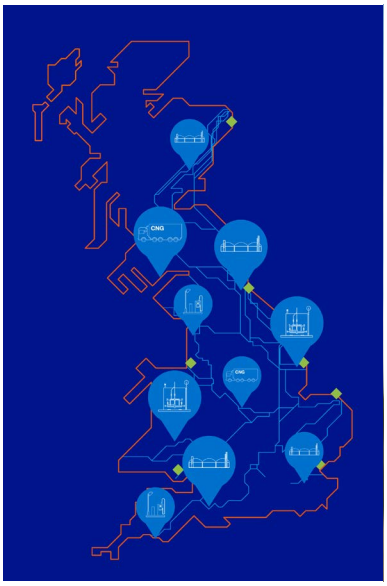
From the identified block valve configurations completed within stage one of the project, four out of the five identified block valve types have two blowdown connections. For these sites, it is possible to have a connection that does not involve a base module. Instead, pipework would connect onto the existing flanges with a pair of manual isolation valves before the pipework commons up and goes below ground. This design also has the added flexibility of being able to be better routed to suit the customers pipeline.

Our simplified exit connection configuration can be seen in the image below.

Simplified exit connection design without ROV

As the pipework is not fixed to a modular base, and for local manual operated valves there is no need for a telemetry kiosk, it is easier to ensure the site layout will comply with T/SP/G/37. This is a National Grid technical specification for site location and layout studies that must be followed.

For the fifth block valve type, which only has one blowdown connection, a modular based solution will be required. This is to ensure that National Grid still comply with their commercial responsibility to provide a bypass for the customer in the event that the main line valve requires maintenance.



Existing site database

One key function of the connections portal is its ability to access existing site information determining the suitability of National Grid's existing sites to accommodate the variety of CLoCC developed standard connection designs and associated pipework sizing (80mm/200mm/300mm pipework).

The assessment included consideration of the following items:

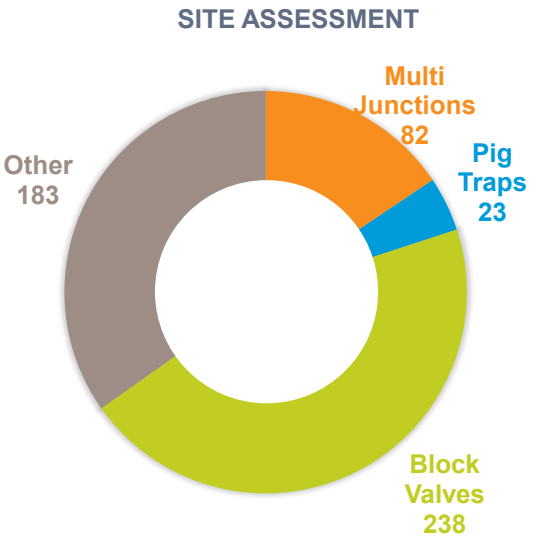
- Availability of a flanged connection point and its size.
- Type of block valve configuration (from 5 common arrangements)
- Available space within the existing security fence line
- Available space to extend within National Grid land ownership
- Ability to extend beyond National Grid land ownership (subject to land purchase and planning permission) and
- Suitability of sites to accommodate the gas quality sampling points 20D downstream of the injection point

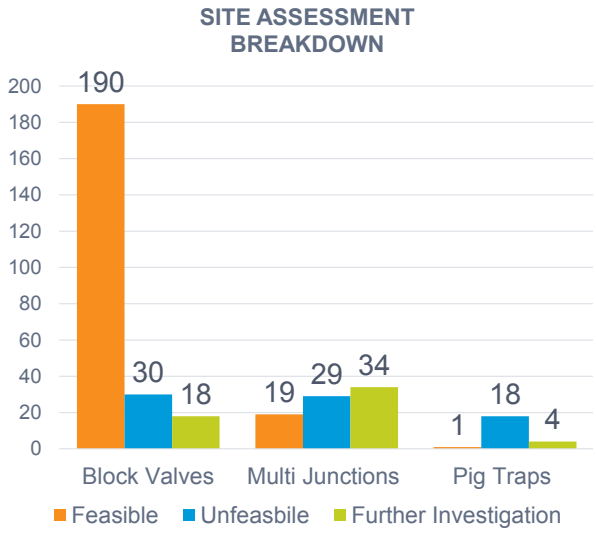
In stage three of the project, work was completed on individual site assessments and captured in the existing site database. This database was then handed over to the connections portal workstream where it was imported for use within the software's logic (See chapter 10.1).

The existing site database assessment looked at 343 out of 526 National Grid sites, including block valves, multi-junctions and pig traps. A CLoCC developed standard design was technically suitable for 210 sites out of the 343 that were assessed. Out of these sites 56 were identified as requiring further investigation before a connection could be offered. The remaining 77 sites assessed as not possible to connect do not appear in the connections portal and hence will not be offered to customers due to being unsuitable.

Compressors, terminals and offtakes were not assessed due to their complexity and individuality. These complex sites have also been identified as requiring further investigation. The activity for "further investigation" will be carried out by the National Grid technical customer connections team during phase 1 of a customer's connection journey (See Appendix C – standard design customer journey).

A documented procedure was produced in parallel with the assessments to capture the assessment criteria, method and required outputs such that assessments can be repeated in the future and the site database accuracy maintained. Sites which are subject to modification, repair, replacement or sites which have offtake connections installed in the future would need to be reassessed and the connections portal database updated accordingly. An internal process has been put in place to capture this requirement.





Technical guidance

Smaller scale NTS gas connections are new for both National Grid and the connecting gas customer. One objective for the project was to standardise and simplify the process and document it for future reference.

The gap in standards and guidance documentation for such connections identified in stage two has been resolved by the production of a Technical Guidance Document within stage three.

The purpose of this document is to guide all connecting customers through the technical aspects of connecting to National Grid's National Transmission System utilising the newly available standard designs. This document will be available for download through the connections portal.

The technical guidance document successfully brings together all relevant designs, learning and knowledge into one place, it's content includes:

- **Standard designs** – introducing the designs and their applications
- **Connection configurations** – such as typical connection schematics for entry and exit, typical site layouts and equipment spacing requirements
- **Site specific guidance** – covering cathodic protection, customer interface points
- **Roles and responsibilities** – for both National Grid and customer
- **Connection steps** – from indicative offer to commissioning

200mm NB Meter module

80mm NB Filter module

As set out in the project's full submission enhancement services further than that of a minimum offtake connection would be considered by the project. A total of 5 enhancement options (filtration, metering, pressure reduction, compression and gas quality monitoring) were considered. Following assessment for technical viability, commercial practicality, legal grounding and with input from our stakeholders within stage 2, these options were rationalised at the start of stage 3. This concluded that only filtration and metering designs would be progressed further by the project's technical workstream.

Compression, pressure reduction and preheat were discounted as there was little customer interest and a large variety of potential process parameters which make it difficult to design a manageable set of standard designs.

National Grid owned and operated enhancements were also discounted on the basis that under our current regulatory framework this could be considered restrictive to competition if NG were to own and maintain the asset on a NG site.

Appetite for the project to progress both filtration and flow metering designs was identified. These have been developed to a point where filtration and flow meter standard designs can be made available to customers for them to utilise with knowledge that these systems would meet with National Grid acceptance.

Further information about the work completed by Premtech Ltd in support of the project's technical workstream can be found in Appendix E.

3.2.2 Build of physical connection solution

The build phase of the project was carried out by Murphy. It was agreed by the project team, with approval from the project's steering committee, that an 80mm Skiosk connection solution would be built, installed and tested at the National Grid Eakring training facility. It was also agreed that 80mm meter and filter skid enhancements were also to be built and tested in order to verify enhancement designs.

Procurement

The procurement process for materials needed to build the CLoCC assets was undertaken by Murphy Group. A datasheet and material take-off of all items to be procured was produced by Premtech Ltd and quotations were obtained from a selection of suppliers containing prices and lead time.

After receiving the quotations from different suppliers, a detailed bid analysis for each quotation was carried out by representatives from Murphy, Premtech and National Grid. A procurement pack was created for each item which included the bid analysis and the recommend supplier. The procurement pack was then sent to Premtech and National Grid for acceptance and approval. Once the pack was approved from National Grid, the order was placed with the selected supplier or sub-contractor.

Fabrication

The following three modules were fabricated in accordance with the projects specifications:

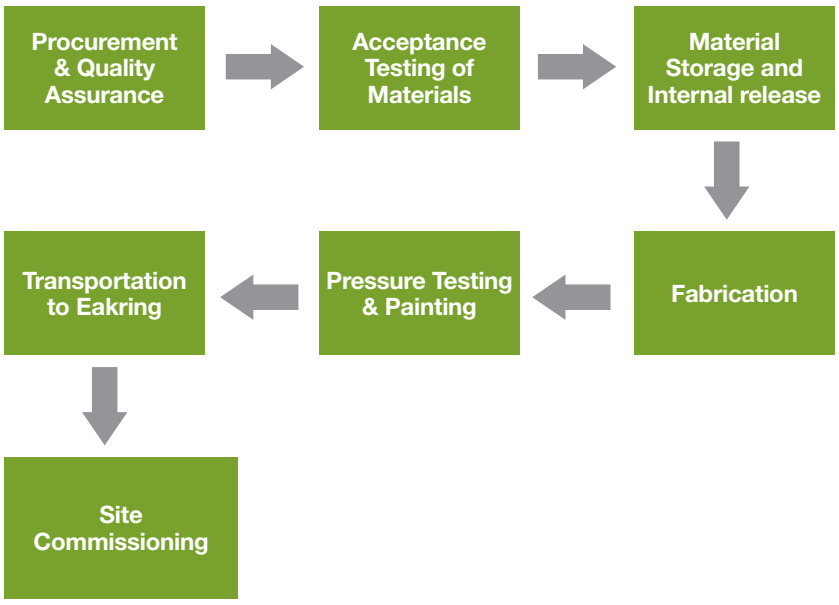
1. 80mm Skiosk
2. 80mm Metering Skid
3. 80mm Filter Skid

Each module was assembled and fabricated at Murphy's Leeds Specialist Welding Services facility in accordance with the approved project drawings.

Materials were received throughout the procurement phase and after quality assurances had been completed of the procured items the materials were stored by Murphy for use, with materials only being released from storage when it was required for fabrication. Fabrication of the modules were in strict accordance with the project drawings. The connecting pipework between the modules were also fabricated in the Leeds fabrication yard. The fabricated parts were pressure tested to the design requirements and then painted to the specified colour in accordance to National Grid specification T/SP/PA/10.

In addition to this the telemetry kiosk portion of the projects "Skiosk" design was assembled and tested by Murphy sub-contractors, Aughton Automation. The kiosk container was fitted out with electrical, control and telemetry equipment.

Generic build phase process



Construction and installation

Whilst the meter module, filter module and Skiosk were being fabricated, Murphy mobilised to the designated test site, National Grid's Eakring training facility, to prepare the site for installation of the connection solution and enhancements. This involved earthworks, the installation of concrete bases, electrical ducting and cabling.

Once fabrication, assembly and testing was completed, the connection solution and enhancements were transported to site and installed in accordance with the accepted design by lifting the modules into place.

First phase of construction – concrete bases installed at Eakring

The picture above shows the fully installed and tested solution at Eakring

Testing

Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT), part of the commissioning process, was carried out at the Eakring test site. The SAT / commissioning involved the end-to-end testing of the connection module signals back to the National Grid Gas Control Centre, GNCC, which demonstrates the communication of signals to and from the Skiosk to National Grid.

The picture above shows the meter skid (foreground) and filter skid (background) enhancements installed at Eakring

Further testing is being carried out on the enhancement modules that have been constructed and installed as part of Project CLoCC. These modules are not part of the final connection but the designs will be made available by National Grid upon request. These testing reports will be issued as part of the final version of the project close out report with additional documentation also submitted to support the FAT/ SAT and commissioning of the metering and filtration modules.

Costing and programme

Murphy have produced a cost and programme estimate for all different combinations and permutations of connection solutions based on the project's suite of standardised designs. There are 39 different combinations in total which sit within the internally facing cost database of the new online connections portal.

Costings have been generated by collating and reviewing the outturn costs from the build phase of the project. These real-life costs have informed the design combination cost estimates which a customer is provided as part of the cost estimating functionality of the connections portal. Lead times for materials and construction have also been reviewed and incorporated into typical programmes for connection projects.

Further information about the work completed by Murphy Group in support of the project's technical workstream can be found in Appendix F.

3.3 Commercial workstream – work carried out

Summary of commercial changes

Area	Why change?	What has changed?	How?	When?
Application to Offer process	To make it quicker and easier to connect to the NTS	Standard Designs have enabled introduction of a quicker process	UNC (Uniform Network Code) modification 0627s (non ROV) and 0629s implementation	Jan 18 (non-ROV) and 30 Oct 18
Capacity	To assist better alignment of the Planning & Advanced Reservation of Capacity Agreement (PARCA) to the new quicker Application to Offer process noted above	Capacity Indicators introduced within the connections portal. Quicker route through a PARCA application for a project with a "green" Capacity Indicator.	UNC modification 0628s implementation	30 Oct 18
Application fees	To make it cheaper to connect to NTS where possible and to apply for capacity reservation	New fees for Standard Design connections and revised fees for Planning & Advanced Reservation of Capacity Agreement (PARCA)	UNC modifications 0629s and 0628s and update to Connection Charging Statement	30 Oct 18
New connection points process	To make the process of adding a new point to the Gas Transporter (GT) Licence easier and quicker to facilitate quicker connections	We have proposed an alternative process to adding points into our GT Licence	National Grid are working with Ofgem to update our GT Licence to change this process	Work ongoing
Contracts	Update and simplify connection contracts where possible	We have reviewed our connection contracts and updated our terms where possible	With feedback from our pilot customer we have reviewed and updated our contracts	30 Oct 18
Gas quality	To allow more flexibility on Entry specification where possible	We will consider requests outside of the Gas Ten Tear Statement (GTYS) and up to GS(M)R	Updated Gas Ten Year Statement	November 2017

Below is further, more detailed information, regarding the commercial changes made by the project.

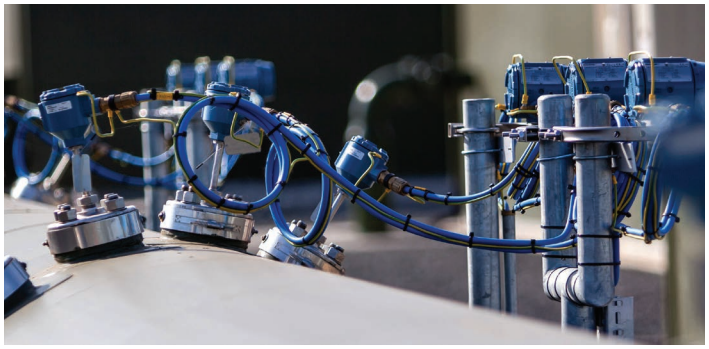
Application to Offer process

The existing Application to Offer (A2O) process outlined within the Uniform Network Code (UNC) was identified as taking too long to enable a connection within the 1 year aspiration set out in our full project submission.

Solutions were compiled to address this limitation by our commercial lead with support from a National Grid commercial workgroup which included key commercial stakeholder teams within the National Grid business. This workgroup met monthly throughout the duration of the project.

By using the automation provided by the connections portal and the pre-approved and pre-appraised standard designs created within the technical workstream, this would allow for a reduction in the time taken for National Grid to make a Full Connection Offer (FCO) to a customer. If the time to provide a customer with a FCO was expected to reduce subsequently we could significantly reduce the associated application fee.

Through industry engagement within Transmission Work Group over the course of a year a UNC modification (0629s) was developed and unanimously supported for implementation with effect from 30th October 2018. This decision was taken in July 2018 to allow time for a consultation on reduced application fees.

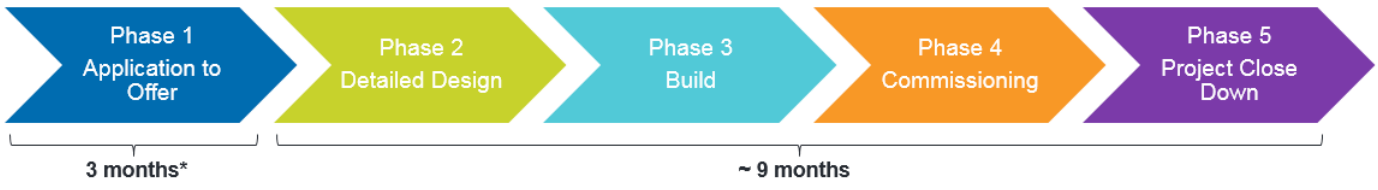


UNC Modification 0629s introduces the following changes to the Application to Offer process:

- Standard Design connection category introduced
- Quicker connection offer established for a Standard Design connection
  - FCO provided by NG within 3 months – previously 6 months
  - FCO provided by NG within 6 months if a feasibility study is required – previously 9 months
  - Fixed application fee

As a result, customers now have an alternative standard design connection application option if appropriate, which enables a quicker and cheaper connection offer. The below diagram illustrates the 2 connection journeys that will be available to customers after Project CLoCC completes. The bespoke connection journey is the only connection option currently available.

Standard Design Connection Journey



* If a feasibility study is required an additional 3 months is added to Phase 1

Bespoke Connection Journey

* If a feasibility study is required an additional 3 months is added to Phase 1

Capacity

Although not originally in the Project CLoCC scope, we received early feedback from our stakeholders that there was appetite for National Grid to align the capacity process for reservation of capacity with the connections process to get maximum benefit for customers. We took this feedback on board and included any changes we could achieve in this area into the project's commercial efforts.

By using the new connections portal functionality, we were able to introduce the concept of Capacity Indicators which would give the customer upfront information on the likelihood of capacity reservation being possible through utilising the existing capacity within the NTS. By building on this we could offer an accelerated route through the PARCA process for a "green" capacity indication as shown through the new connections portal. Receiving "green" capacity indication as a customer also means that a cheaper fee is payable.

Through industry engagement within Transmission Work Group, alongside the A2O modification (0629s), a developed solution was confirmed for implementation with effect from 30th October 2018.

UNC Modification 0628s amends the PARCA process as follows:

- Introduction of Capacity Indicators
- An accelerated route through PARCA for "green" Capacity Indicators
  - Phase 1 Works report delivered within 3 months (or 4 months if PARCA window is open for 40 business days) – existing process takes up to 6 months.

These changes mean that there is now a quicker route through PARCA that better aligns with the standard design connection offer timeline, for a green Capacity Indicator.

The relevant Capacity Methodology Statements will be updated as part of a routine review and updated to include any resulting changes. This is through co-ordination with the Future Markets Gas team.

Capacity indication

Green – faster route

Amber – further analysis

Red – existing process

Removing ROV requirement

Due to the technical challenge made on the requirement for a Remotely Operable Valve (as detailed in section 3.2.1) it was identified that an amendment to the rules in UNC would be required to commercially achieve this.

We are now able to offer a case by case analysis of this requirement for exit points and state that a ROV should no longer be an absolute requirement.

UNC Modification 0627s was successfully implemented with effect from 17th January 2018 after development at Transmission Work Group. The approach was taken to advance with this modification at the earliest opportunity so that customers could benefit from this change ahead of Project CLoCC completing.

This change means that National Grid now has discretion over whether a ROV is required at new NTS exit connections, supporting use of the project's simplified exit connection designs which is estimated to save customers approximately £100-£200K depending on the size of connection required.

Application fees

The expedited Application to Offer and PARCA processes have allowed the application fees to be reassessed and reduced for standard design connection applications and for "green" Capacity Indicator PARCA applications. A full activity based costing analysis was carried out to establish the new fees.

Following successful implementation of UNC modification decisions in July 2018 (0628s, 0629s), The Statement for Gas Transmission Connection Charging was revised and consulted on in order to update the Application fees for both connection and PARCA processes.

A consultation on The Statement for Gas Transmission Connection Charging concluded on 21st September 2018 and a notice of implementation was issued to take effect from 30th October 2018 to align with UNC implementation. The new fees are shown in the adjacent table.

88% reduction

in connection application fee for standard design eligible customers

Fixed application fee

for standard design customers

Category	New Fees	Type
Standard design FCO	£13k	Fixed
Standard design feasibility study – a study to include a site visit to access suitability for standard design	£14k	Actual
Category	**New fees**	**Type**
PARCA – Simple (Green or amber capacity indicator	£53k	Actual
PARCA – Complex (Red capacity indicator	£120k	Actual
PARCA – Top up (Simple to complex)	£67k	Actual

New points process

Currently any new point connecting to the NTS is required to be entered into National Grid's Gas Transporter Licence.

The existing process to add new points into the Licence takes an average of 6 months and was identified as a potential blocker to quicker connections early in the project. Discussions were initiated with Ofgem regarding options for changing the Licence requirement, and a solution developed by National Grid remains in discussion with Ofgem.

This activity will continue beyond Project CLoCC in order to achieve an alternative solution. The relevant Capacity Methodology Statements will be updated as part of a routine review and updated to include any relevant changes. This is through co-ordination with the Future Markets team.

Customer connection contracts

All customer connection contracts have been reviewed by Project CLoCC and adapted for Standard Design connection, if applicable, to simplify terms where possible. Our pilot customer has provided great input in this space, through constructive feedback, ensuring that any improvements are directly beneficial to our potential new customers.

These contracts are bilateral agreements between our customers and National Grid with generic terms being a starting point from which to form an agreement.

Oxygen limit relaxation

Through review of the Gas Ten Year Statement (GTYS), we were able to adapt our approach to the gas quality specification to be more flexible for oxygen. Having talked to potential biomethane customers we knew that this was a potential blocker as the NTS specification was more stringent than the Gas Safety (Management) Regulations (GS(M)R).

Following investigation with the relevant teams in the National Grid business it was felt that we could offer more flexibility with respect to oxygen specification and assess requests on a case by case basis. As a result, the GTYS was updated from November 2017 enabling National Grid to consider oxygen specification up to GS(M)R. This project output has since been utilised by our project pilot customer.

Enhancements

As outlined in our January 2018 Project CLoCC-Progress Report, options were assessed regarding offering of enhancement services by National Grid to customers. This varied from National Grid owning and operating enhancement assets on National Grid sites, through to customers using enhancement assets on their own site.

Internal challenge and review discounted National Grid owned and operated enhancements on the basis that under our current regulatory framework this could be considered restrictive to competition. Due to competition law and National Grid's unique position as NTS transmission owner and system operator it was considered inappropriate for National Grid to own these assets and for them to reside on a National Grid site.

The project therefore chose to continue developing enhancement designs which were to be offered as free-issue designs to customers for use on their own site (see chapter 3.2 for further information).

Other service options that could be offered by National Grid in the future have been fed back to the business for later consideration.

4. Outcomes of project

Project CLoCC was setup to reduce the time and cost of connections to the NTS for an emerging potential customer base and has successfully demonstrated that this is achievable through development of a software platform, technical standard design and commercial modifications. Each workstream has performed strongly during this project with numerous activities successfully completed and others further advanced in order to reduce both time and costs for connecting gas customers to the National Transmission System.

Time and cost savings achieved has led to a significant increase in interest from customers wishing to connect to the NTS and is confirmation that customers recognise that the network is now an option for them to consider. At the time of printing, National Grid have received interest from 12 different customers enquiring about 25 different potential connection sites. Four of these customers have confirmed that they will be applying for a connection as soon as the project is live. Historically the National Grid connections team have dealt with circa. 10 project specific pre-connection requests over a twelve-month period, therefore an increase of 60% is notable.

A quantitative demonstration of time and cost saving outputs has been represented by considering the standard design connection journey a customer follows. The intention of project CLoCC was to focus on improvements to the Application to Offer phase of a connection journey primarily (Appendix C - phase 1), as such the table overleaf also focusses on time and cost savings during this phase, with key items where savings have been noted specifically highlighted.

Note – time and cost saving comparisons shown in the table overleaf are based on estimations expected from Project CLoCC outputs against data used in the original project submission bid (2015).

As a result of Project CLoCC, National Grid is also taking the opportunity to review all other Application to Offer fees relevant to bespoke (non-standard design) connections, in particular the application fee relevant to Greenfield connections.

Standard Design Programme	Time Estimates (business days)		Cost Estimates		% Time Reduction Estimated	% Cost Reduction Estimated	Comments
	Pre-CLoCC (average)	**Post**-CLoCC Estimation	**Pre**-CLoCC (average)	**Post**-CLoCC Estimation			
Customer pre-application activity	equ. 5 man days	1 day					Time saving – Customer can independently complete analysis and project optioneering via the connections portal. Cost saving – Customer can independently complete analysis and project optioneering via the connections portal without travelling to meet with National Grid, although face-to-face meetings are still available and encouraged.
Phase 1 – Application to Offer (A2O)							
Customer applies for standard design connection	5 days	1 day			80%		Time saving – achieved via use of connections portal.
Application form Competency check	5 days	5 days					
NG raises invoice for Application Fee	1 day	1 day	£109,000	£13,000		88%	Cost savings – UNC modification 0629s.
Funds Cleared = **CLOCK STARTS**							
NG Validation Period	60 days	21 days			65%		Time saving – achieved through use of connection portal and process improvement.
FCO issued to customer	180 days	60 days			68%		Time saving – UNC modification 0629s.
Customer accepts + signs FCO – NG countersign	1 day	1 day					
NG raises invoice for 1st instalment	7 day	7 day					
Funds Cleared – Customer pays 1st instalment (40%)			£800,000	£400,000		50%	First instalment cost reduced as expected connection cost is £1M or less.
NG initiate new connection point in licence table via Ofgem consultation	120 days	120 days					
Project handover to National Grid delivery units	1 day	1 day					
Phase 2 – Detailed Design stage							
Detailed design contract awarded to design house	4 weeks	4 weeks					
Detailed designs completed + received by NG	11 weeks	7 weeks		£30,000 - £52,500			Time saving – dependant on connection type (e.g. greenfield, AGI, entry, exit). Data shown in relation to estimations for a non-ROV Exit connection project. Cost saving – dependant on connection type (e.g. greenfield, AGI, entry, exit).
Updated project programme developed	5 days	5 days					
Updated project costs developed	1 day	1 day					
Detailed designs provided to customer	1 day	1 day					
Invoice raised for 2nd instalment	7 days	7 days					
Funds Cleared – Customer pays 2nd instalment (40%)			£800,000	£400,000		50%	Second instalment cost reduced as expected connection cost is £1M or less.
Phase 3 – Build		120 days					
Funds Cleared – Customer pays 3rd instalment (20%)			£400,000	£200,000		50%	Third instalment cost reduced as expected connection cost is £1M or less.
Phase 4 – Commissioning							
Phase 5 – Project Close Down							

It is of note that the entire connections process has been reviewed, and process improvements in all areas have been identified. Information to support cost and time savings in the latter phases of a connections journey will be available following connection of our pilot customer opportunity and the first standard design customers. A complete view of network performance improvement will then be well understood and evidenced. As previously stated, this demonstration work is currently underway (e.g. pilot customer opportunity).

Project CLoCC was originally scoped out as an innovation project under Technology Readiness Level (TRL) 4-6 – Development activities with a more commercial application including technology validation and or demonstration in a working environment.

As the project programme progressed, and through customer and stakeholder engagement conducted by the project team, it became clear that appetite was strong for the project's TRL level to expand to TRL 7-8 – Full scale demonstration in a working environment to test and improve technologies so they are ready for commercial deployment.

This transition has been achieved by the following activities:

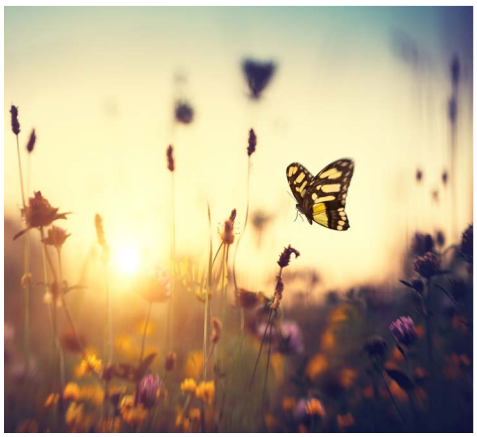
- Release of pilot customer Expression of Interest document to industry (Jan 2018) to establish a pilot project to support testing and validation of project outputs.
- Successful onboarding of pilot customer opportunity. Contract signed with pilot customer in May 2018. This activity remains live and will continue once this innovation project closes. A full handover of this activity has taken place and the National Grid business continues to progress and document learning to benefit future projects.
- Scale of business implementation greater than originally anticipated with business teams ready to utilise project developments as soon as practically possible. This has been achieved through training sessions and a high level of internal project awareness.
- Installation of full scale physical connection solutions at National Grid's training facility, Eakring. Commissioning and end to end testing completed.
- Handover of gas connections portal to National Grid business for technical re-confirmation checks including digital risk and cyber security testing.

To understand in more detail how the proposed solutions adopted by this project may be applied to your network please refer to chapter 11 – project replication.

5. Performance compared to original project aims, objectives and SDRC deliverables

The main objectives of this project were to explore and implement ways to reduce the time and cost of gas connections to the NTS. These objectives were tackled in several ways and the result has been that cost and time savings have been achieved for gas connection customers (Appendix G – stakeholder day feedback).

The project has performed well compared with its original project aims, objectives and SDRC deliverables.



Activity successfully completed	Associated objective	
	Time reduction	Cost reduction
Development of gas customer connections portal to streamline Application to Offer process	**Yes** – replacement of paper based process by online method	**Yes** – reduced administration
New indicative cost estimate and mapping functionality – new to the connection process	**Yes** – instant customer information available	**Yes** – free upfront high level information for customers
Online status information, information transparency	**Yes**– information available on demand	**Yes** – reduced time to obtain information
Development of approved standardised connection designs in a variety of pipework sizes	**Yes** – designs ready "off the shelf" to support both conceptual design and detailed design project stages	**Yes** – majority of design work completed for MOC. Reduced site specific detailed design work required.
Technical guidance documentation	**Yes**– key information available in one place	**Yes** – a consistent approach to connections will minimise cost associated with risk and uncertainty.
Development of existing site database	**Yes** – all block valve, multi-junction and pig trap sites have been assessed for their suitability for a "Standard Design" connection	**Yes** – reduced site investigation work required
Development of pre-populated Conceptual Design Studies (CDS)	**Yes** – pre-populated Conceptual Design Studies created by the portal for NG to review and edit prior to releasing to customer	**Yes** – reduction in NG administrative efforts reduces activity time, and therefore cost
Detailed Design	**Yes** – already produced standardised designs reduces the amount of time required to complete detailed designs	**Yes** – already produced standardised designs reduces the amount of time, and associated costs, required to complete detailed designs
Enhancement designs for use by customer, on customer site	**Yes** – potential to reduce customer design time	**Yes** – potential to reduce customer design costs
Uniform Network Code change 0627s (non-ROV)	**Yes** – significant reduction of materials required and a significant reduction of time required on site	**Yes** – reduced materials spend and time required on site
Uniform Network Code change 0628s (reduced route through PARCA if eligible)	**Yes** – reduced timeline from 6 months to 3 months if capacity indication shows to be "green" within the connections portal	**Yes** – reduced fee if customer project shows to be suitable for the accelerated PARCA route
Uniform Network Code change 0629s (new connection category – Standard Design)	**Yes** – reduced timeline from 6 months to 3 months for standard design connections	**Yes** – reduced fee if project suitable for standard design connection
Gas quality – Gas Ten Year Statement updated (oxygen consideration)	N/A	**Yes** – potential savings in gas specification clean up required
Successfully built, installed and tested connection solution standard designs	**Yes** – time reduction lessons identified and fed back into G/19 designs	**Yes** – cost reduction lessons identified and fed back into G/19 designs

A Successful Delivery Reward Criteria status and performance summary is shown below.

SDRC	Description	Evidence	Status
Knowledge, Learning & Dissemination Strategy (9.1)	Deliver project website (01/04/2016)	Project website created with facility to register interest and comments implemented and actively being used by interested stakeholders	100% Complete
	Facility to register interest in website implemented (01/04/2016)	Functionality developed and coded	100% Complete
	Deliver Project Communications Plan (01/04/2016)	Project communications plan submitted on time with communications strategy actively being followed by the project team.	100% Complete
Production and release of internal and external process change document (9.2)	Deficiencies and Limitations with Transmission Legislation/ Standards/Codes and specifications identified and documented (30/09/2016)	Documentation submitted: 1. Project process change report 2. Project process change background information document	100% Complete
	Deficiencies and Limitations with distribution Legislation/ Standards/Codes and specifications identified and documented (30/09/2016)		
	Production of a full report identifying commercial and regulatory impacts to the project and proposed changes to processes (30/09/2016		
Visual online portal prototype available for test (9.3)	Existing site as-built data classified and pegged with supplementary data (12/12/2016)	Portal prototype "live" for challenge and review from 12th Dec 2016. External stakeholder challenge and review carried out during stakeholder discussion day (22/02/17)	100% Complete
	Visual Online portal prototype tested (12/12/2016)		
Completion of detailed connection solution designs (9.4)	Buildability and maintainability study complete for three standard designs (12/02/2018)	Submission included: **9.4A** – Buildability and Maintainability studies **9.4B** – Detailed Drawing Packs covering: • Detailed Drawing Pack 1 – Minimum connection module solutions • Detailed Drawing Pack 2 – Telemetry kiosk • Detailed Drawing Pack 3 – Interconnecting pipework and simplified connections • Detailed Drawing Pack 4 – Combined connection module and kiosk (Skiosk) • Detailed Drawing Pack 5 – Filter module • Detailed Drawing Pack 6 – Meter module	100% Complete
	Detailed drawing pack issued (12/02/2018)		100% Complete

SDRC	Description	Evidence	Status
Live customer online portal available (9.5)	End-to-end functionality testing complete (17/07/2018)	Aqua consultants User Acceptance Testing report submitted 17/07/18 – covering User Testing and End to End functionality testing.	100% Complete
	User functionality testing complete (17/07/2018)		100% Complete
	Live customer online portal available (17/07/2018)	Portal URL and login details provided to Ofgem for use – submitted 17/07/18	100% Complete
Online tests of connection solution complete (9.6)	Factory acceptance testing of connection skid equipment complete (28/09/2018)	Factory Acceptance Testing (FAT) was carried out by Aughton Automation on 17/09/18.	100% Complete
	Connection skid transported to designated test site (28/09/2018)	Murphy transported and installed all skids at National Grid's Training Centre in Newark, NG22 0DA, for the purposes of testing and for the CLoCC stake-holder event, taking place on 20/09/2018	100% Complete
	Construction and installation of connection skid complete (28/09/2018)		
	Commissioning/online tests of connection skid complete (28/09/2018)	SAT / commissioning involved the end-to-end testing of the connection skid signals back to the National Grid Gas Control Centre, GNCC. This occurred on 19/09/18.	100% Complete
Full connections handover pack issued to NG (9.7)	As-built drawings and Health & Safety file complete and returned to NG (29/10/2018)	As-built drawings have been completed and included in the Murphy Partner Report Appendix M. A Health and Safety File cannot be completed until the minimum connection solution is installed on the customer site but all key databook information is included in the Murphy Partner Report Appendices ready for final incorporation.	100% Complete
	Stage 3 completion report issued (29/10/2018)	Report issued to steering committee on 24/10/18. Report issued to Ofgem on 29/10/18.	100% Complete
	Final Stakeholder challenge and review session held (29/10/2018)	CLoCC final stakeholder event held on the 20/09/2018 at the National Grid training facility, Eakring. 27 attendees confirmed. See www.projectclocc.com for further information.	100% Complete
	Full final Project CLoCC application pack issued to NGG NTS for implementation into business as usual (29/10/2018)	Project CLoCC application pack issued to NGG on 29/10/18. Pack includes; commercial & technical internal briefing notes, connection application user guidance, return to business document, set of gas connections portal terms & conditions, revised standard contracts, connections portal URL and user guides, updated Charging Statement.	100% Complete
Project evaluation and final report (9.8)	Production of a detailed final report to close down the project – this will include project findings knowledge and learning generated for distribution as per the dissemination strategy SDRC 9.11 (29/10/2018)	Project close down report submitted to two distribution networks and ofgem for peer review on 29/10/18	100% Complete

During this project, each workstream widely considered options for customer time and cost saving. Ideas were generated through a global tech-watch, team workshops and industry engagement. An account of activities outlined in the original project scope which did not progress is detailed below, also detailed are time and cost saving ideas which the project team began to consider, but later chose to not progress further. Reasoning for all choices is summarised below.

Activity not successfully completed	Reason for outcome
Original scope – Enhanced connection solution within National Grid owned land	National Grid owning assets within own land legally deemed as anti-competitive
Original scope – Provision for multiple customers off a single connection	Commercially complicated to standardise this type of situation at this time due to the following factors: – If multiple inlets/outlets are required to the connection then the first connecting customer would be required to pay for valves and fittings to facilitate connecting a module for potentially a second customer, which may never materialise – If a single inlet/outlet is required to the connection supplying multiple end users then the NG validation activities will be different from standard validation activities due to the requirement to validate multiple end users. Designs created by the project do allow for a second customer to connect at an already connected site (assuming there is available space) by modifying pipework at the time of the second connection. This type of situation is to be managed on a case by case basis by National Grid and in agreement with all relevant stakeholders involved.
Additional idea – Utilisation of renewable kiosk innovation	Renewable kiosk found to be underpowered due to software upgrades made in connection with site security. National Grid continues to review this opportunity outside of Project CLoCC.
Additional idea – Alternative solution to the requirement for 20D* gas quality sampling	Difficult to standardise solution as many customer specific variables exist. Solution remains project specific as subject to assessment.
Additional idea – Inclusion of blending facilities	Out of scope for this project. Discussion continues by National Grid within RIIO T2 activities.
Additional idea – New licence point process implemented	Positive progress on this item with Ofgem. Activity continues to be progressed by National Grid business as usual teams. Expected implementation 2019.
Use of industry standard pipe and fittings	The benefit of moving away from higher specification National Grid standards for materials did not outweigh the challenges of getting standards and policies changed at this time. Replacement specifications are still required to properly order materials. National Grid continues to review this potential future opportunity. Note – Industry standard pipe was used within the build element of this project under a deviation from National Grid
Installation at customer pilot site	This work continues past the close of Project CLoCC, supported by National Grid business as usual teams and in line with customer requirements.

6. Required modifications to the planned approach

This project has made three main modifications to the originally planned approach, all modifications were made in order to strengthen the final project outputs through increasing flexibility and knowledge gained. The three required modifications during Project CLoCC are detailed below.

Pilot customer – scope expansion

"We wholeheartedly believe in anaerobic digestion technology and the part it will play in the UKs future recycling and energy generation strategy. We are pioneering a new green power source and setting the standard for future bio-plants and look forward to working with Project CLoCC to become the first 'green' biomethane site to connect to the NTS."

Derek Burgoyne,
Managing Director of Biocow Ltd

Through stakeholder engagement conducted early in the project schedule it became clear that real interest existed from potential gas customers to utilise the expected outputs of Project CLoCC once the project completed. As we progressed against our work programmes customer and stakeholder appetite continued to increase naturally. This took the project from an anticipated readiness level of developing, validating and demonstrating project outputs prior to closure, to needing to be ready to actively implement our outputs as soon as the project completed (transition from TRL 4-6 to TRL 7-8, see Chapter 4 for further information).

To support this transition in technology readiness it was decided, with approval by both project sponsor and steering committee, that the project team would seek interest from parties wishing to become the Project CLoCC pilot customer. This additional activity would broaden testing of our project outputs to date at a connection site in collaboration with a real customer and would provide valuable proof of concept information prior to project completion, neither of which were planned in the project's original approach.

Timeline and cost reductions developed so far by the project have been practically validated improving confidence and accuracy in the final deliverables provided to National Grid on the 29 October 2018.

Securing a pilot customer opportunity has also ensured that project fabrication and build efforts have guaranteed customer benefits and that innovation resourcing is tangibly linked to customer benefit. Realisation of expected customer benefits prior to project close has helped to transition CLoCC from a standalone innovation workpiece to being a realistic new process solution ensuring that gas connection customers are supported in the future.

See Appendix H for further information regarding our pilot customer opportunity.

Require modifications

Existing site database re-work

The existing site database is a critical project output. This technical database holds valuable Above Ground Installation (AGI) site data and has been completed through a thorough assessment of all block valve, multi-junction and pig trap sites on the network. The database holds information on which standard designs fit within a given National Grid AGI site and therefore drives the technical result offered to a customer via the new gas connections portal.

The planned approach for creating the existing site database sat within the project's software development workstream, as this database sits within the logic of the gas connections portal. However, scope for the existing site database activity grew following confirmation by the project's steering committee that as many sites as possible should be assessed and not only block-valve sites as originally planned.

A significant amount of further technical assessment work was therefore required and this work appropriately sat within the project's technical workstream. Repositioning this activity to sit within the technical workstream for completion by the project's technical design house, Premtech Ltd, also allowed for expansion of its scope. In addition to assessment of National Grid multi-junction sites Premtech also completed site assessment for gas quality monitoring. This involved investigating whether or not gas quality sampling equipment could be positioned within the National Grid site locality at a distance of 20 x pipe diameter up and downstream of the gas injection point. This is the current standard solution applied to demonstrate gas quality compliance on the National Transmission System.

Software development methodology changes – supporting AGILE

On submission for funding each project partner company had clear and confirmed activity programmes with associated payment schedules outlined. This planned approach, for the most part, has worked in all cases except the project's software development workstream. For our software workstream a set out and rigid activity plan was extremely restricting, causing risk to the value and relevance of outputs generated.

Software development is recognised as more effective when following an AGILE approach, a management approach adopting several iterative and incremental software development methodologies so that timebound work "sprints" can be completed following regular client challenge and review. In this case by the CLoCC team and business end user, the Gas Contract Management Team within National Grid.

The planned approach for the projects software development workstream was not outlined to work in this way, therefore during Stage 2 of the project, and with steering committee agreement, Aqua consultants' activity schedule and associated payment structure was altered to follow an iterative methodology (AGILE). Agreed contractual funds were not altered at this time.

Updating the methodology in this way has allowed for greater flexibility within the workstream to consider removal and addition of important functionality requirements, highlighted as part of stakeholder challenge and review sessions. The new approach has also ensured that the created portal has been able to adapt to wider customer and stakeholder feedback, received at numerous CLoCC stakeholder events. Lastly, this approach has ensured better alignment between work completed and associated invoice submission.

Software development methodology – prototype creation

An item overlooked within the original approach was that of creating a prototype version of the gas connections portal. Early on in the project this was highlighted as a limitation as the project was unable to share early portal design ideas effectively making it difficult to gain valuable challenge and review feedback. This was overcome by Aqua consultants creating a demonstration portal, a limited functionality prototype version of the final portal.

This proved to be an invaluable change to methodology and output from the software development workstream. It supported rich and informed evaluation of the conceptual ideas to date, which in turn enabled informed decision making to take place at a greater level than originally possible.

7. Significant variance in expected costs

Project CLoCC shows an expenditure of £4.5M (accurate on 25/01/19)

Below shows a table of final project spend against allocated budget (as per Ofgem direction document, Appendix A). Figures accurate 25/01/19

Cost Category	Figures accurate 25/01/19	Actual Spend (£k)	Variance Saving (£k)	Variance Saving (%)
Labour	£1,333.00	£1,155.58	£177.42	13%
Equipment	£1,297.00	£917.74	£379.26	29%
Contractors	£2,518.00	£2,450.11	£67.89	3%
IT	£0.00		-	
IPR Costs	£0.00		-	
Travel & expenses	£143.00	£4.82	£138.18	97%
Payments to users	£0.00		-	
Contingency	£142.00		£142.00	100%
Decommissioning	£0.00		-	
Other	£0.00		-	
Total	**5,433.00**	**4,528.24**	**904.76**	**17%**

Variances are explained as follows:

NG Labour – There has been a reduction in labour expenditure resulting from several contributing factors. These are summarised as; diligent financial control and economical project resourcing, onboarding of a pilot customer opportunity which enabled resources to be streamlined and a break in spend as a result of the time required to change commercial lead at the end of stage two.

Equipment – There has been a reduced spend in this category due to a smaller number of enhancement options being progressed by the project team following stakeholder feedback, the project fabricated and built a meter and filter solution only. The project's construction partners, Murphy Group, also conducted a comprehensive tendering process to source competitively priced equipment which contributed to a reduction in equipment expenditure.

It should be noted that there is expected to be further reduction in equipment spend due to successful onboarding of the project's pilot customer opportunity which is due to transfer costs from the innovation project to the customer's project account. This is in line with UNC which states that a customer is required to pay for Construction Works in support of their connection project (Uniform Network Code, TPD Section Y – Charging Methodology).

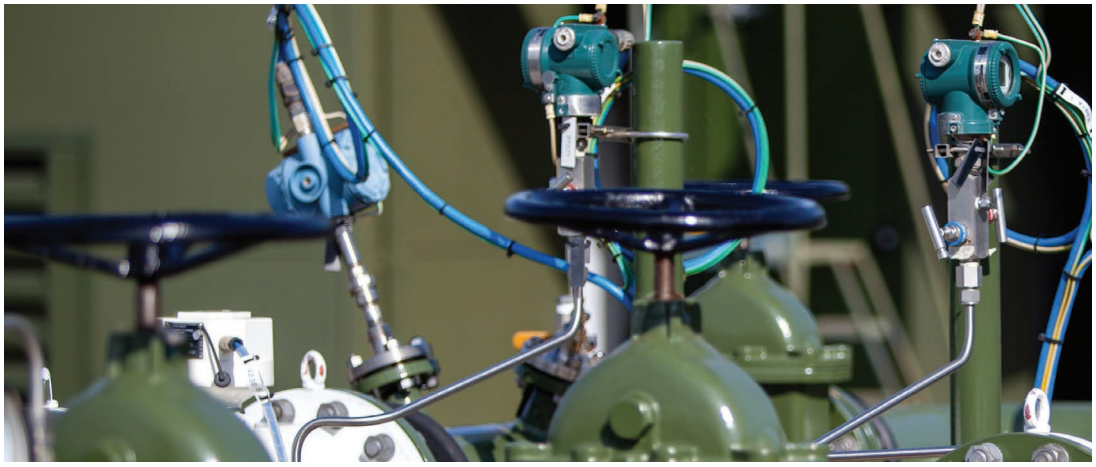
Contractors – Variance less than 10%.

Travel and Expenses – Underspend in this category results from the project team endeavouring to attend project meetings, conferences and events in a cost-effective manner, as such duplication of attendance is avoided where possible to keep costs down.

Contingency – No contingency funding has been required by the project.

Return of underspent NIC Funding

In line with Gas Network Innovation Competition Governance Document v 3.0, sections 8.70-8.77, Project CLoCC will be returning Category 2 revenues "underspent NIC funding, as a result of the Project acting in line with its Project Direction". Detailed financial figures are confidential and will be provided to Ofgem alongside this project close down report.



8. Updated business case

The overall business case for carrying out this project has strengthened since the project was submitted for funding. Furthermore, since February 2018 there has been significant external focus on the role decarbonised gas could play in meeting 2050 carbon targets, with Project CLoCC well positioned as a potential supporting enabler in this area. Supporting detail is shown below as to how developments have affected the benefits gained from the project.

The gas networks deliver **three times** the energy delivered by the electricity networks.

Pilot customer opportunity

- Through competitive scoring the project selected a biomethane customer to become our selected pilot customer opportunity. Biocow Ltd, leading developers in anaerobic digestion technology, will become the first biomethane customer to inject gas directly into the National Transmission System demonstrating the very real need to adapt the network to support a future generation of gas customers. This concept was introduced as part of the project's full submission and is quantified by contract signature between Biocow Ltd and National Grid plc in May 2018. The project is aiming to complete by May 2019 in line with Project CLoCC's 12 month timeline aspiration.
- Furthermore, financial benefit has already been realised by our pilot customer equalling £109,000. This is as a result of the project's update to The Statement for Gas Transmission Connection Charging at that time, which changed the gas connection application fee for our pilot customer to £0.00. Going forward a standard design application will cost a fixed fee of £13,000, with an additional £14,000 required should a feasibility study be required.

Interest from indigenous gas sources

- In addition to interest received from the biomethane community in response to the announcement of our pilot customer opportunity interest was also received by developers in the transportation, shale and electricity generation sectors. Nine pilot customer applications were received in total, supporting our understanding of what our potential future customer base may look like.

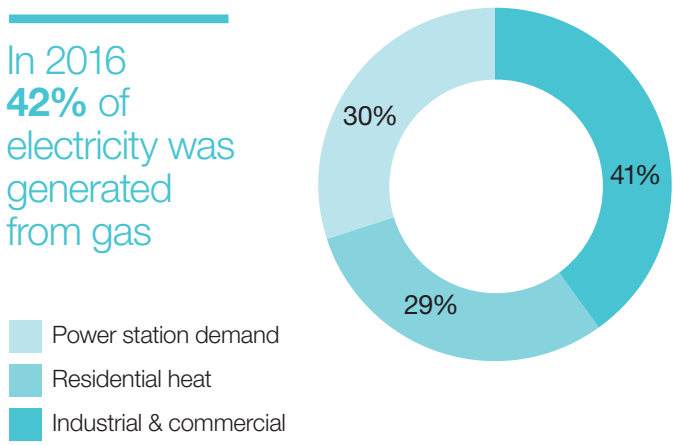
Dissemination of project outputs

- The project confirmed in stage 3 that all technical designs would be free-issued to the energy sector following project close, further supporting the sharing of project knowledge. Further to this a blueprint of the gas connections portal will be made available so that other networks are able to consider developing similar platforms by starting at a more advanced position.

Interest from other networks

- It was always anticipated that outputs from the project would be beneficial to other networks. Throughout the project, we have received great support from UK distribution networks and towards the latter stages of our work several European networks (e.g. Gas Networks Ireland and ENGAS, Spain) have also expressed interest in learning more about our work. Of notable interest is the removal of the absolute requirement for a ROV for exit connections, the potential to replicate the gas connections portal and upfront capacity indication information. Currently we believe our smallest and most simple standardised design, an 80mm non-ROV exit connection MOC, will cost the customer between £475,000 - £600,000 This figure includes the costs for; materials, detailed designs, main works contractor, project services and National Grid staff costs.

In 2016 **42%** of electricity was generated from gas



Shale industry development

- On 19th September 2018 Cuadrilla was granted hydraulic fracturing consent for a second horizontal shale gas well onshore UK with gas flow results expected early in 2019. This demonstrates progress for the shale industry within the UK and is an example of a potential future customer who may approach the NTS for a gas connection in the future. It is notable that one shale company applied to become the project's pilot customer.

Renewable Heat Incentive news

- On 22nd May the Non Domestic Renewable Heat Incentive (RHI) was updated to include the tariff guarantee. This development could further incentivise biomethane plants to develop and look for connections to NTS.

Distribution Network capacity

- We have been informed by potential customers that in some areas the distribution network's capacity availability is restricted at this time and therefore the opportunity to be able to consider the NTS as a viable alternative connection option is welcomed.

Expanded scope of new gas connections portal

- Through comprehensive stakeholder engagement development of the connections portal has expanded to include increased alignment between both connection and capacity application processes, and confirmation that the new portal will be open for use by all gas connection customers, not only those eligible for a standard design connection. This results in wider customers benefit from development of an online connections tool.

The project continues to support knowledge sharing surrounding the future of gas. We believe that gas will continue to play an important role in supplying the UK's energy needs to 2050 and beyond. In March 2018 the Future of Gas project released their report entitled, The Future of Gas: How gas can support a low carbon future. Within this report Project CLoCC is highlighted as an enabling project in areas such as transport and future networks and markets. Our outputs have been identified as facilitating quicker, lower cost connections to the NTS which is hoped to open up the network for the future.

By aligning with other projects, such as the National Grid Future of Gas (FOG) Project, CLoCC is assisting in areas of wider industry discussion.

More information on FOG can be found at **www.futureofgas.uk**

Today's gas market and the gas networks play an important role across the UK economy, providing the majority of energy to homes, businesses and industries.

8/10

of UK homes use gas for heat

60,000

new consumers are connected to the gas network each year

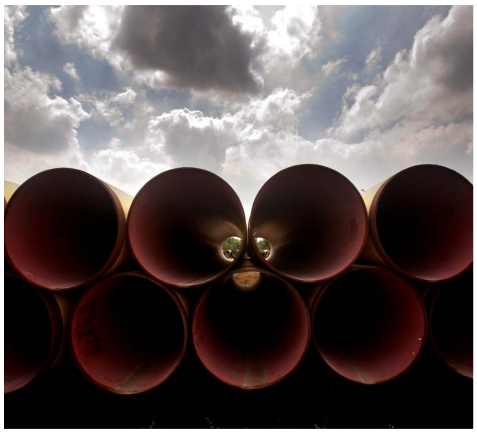
96,000

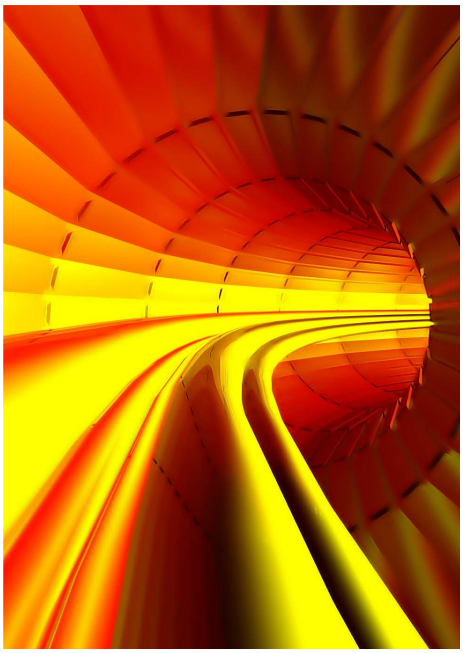
gas connections have been made since 2007 to address fuel poverty

9. Lessons learnt for future innovation projects

Tackling the subject areas of software development, technical design and commercial improvement in unison, and underneath one overarching project, has been incredibly beneficial as it has ensured that a practical and holistic solution would be achieved for our gas customers when the project completed. The nature of executing such a multi-faceted project has however been complex. Challenges arose in ensuring that very different activity timelines remained aligned and that each workstream was fully aware of the impact it may have in another area of the project. Strong inter-team communication and sense of collaboration has helped to mitigate potential risk areas and methods for improved working have continuously been highlighted and trialled by the project team who always strived to improve and develop.

A summary of key learning gained by the project team is shown in the below table, categorised into “lesson type”. For a full breakdown of learning achieved by the project please refer to Appendix I – lessons learnt log.





Lesson Type Category	Lesson Summary	Situation & Recommendations
Project Setup	Early involvement of specialist team	It is recommended that all specialist team areas are identified in full, however minor to the project scope, and requested to advise during the project setup stage (e.g. project partner contractual agreements).
Project Execution	Clearly set out expectations for SDRC deliverables	Some unclear wording of the project's SDRC requirements added risk of expectations not being met by the project's stakeholders. It is advisable to clarify SDRC expectations as early as possible during the project's execution.
Project Close	Awareness of the need to begin handover discussions early in the project	Early engagement with all relevant business stakeholders has proved essential in order to establish clear lines for handover of project outputs. This activity is significant and should not be underestimated.
Team	Naturally collaborative team	Inherently innovation projects require strong ability and willingness to work through ambiguity and change. Ensuring an innovation team comprises collaborative, motivative and constructively challenging people is essential. Those who can work through ambiguity and remain focussed on creating improvement are invaluable members.
Stakeholders	Importance of engagement	A comprehensive communications plan is required in order to keep stakeholder engagement appropriate and relevant. This plan needs to be managed by a dedicated resource with communications experience. An example of positive engagement conducted by the project is shown through continuing support expressed by the ENA Biomethane Network and Transmission Workgroup. The frequency and level of engagement with this project stakeholder has worked well.
Connections Portal	Value of prototyping	For any software development, it is recommended that a prototype version of the solution is part of the original plan and schedule. Prototype creation was not originally planned into the CLoCC schedule resulting in challenges in making informed critical software decisions and avoiding rework. The AGILE development approach increases flexibility and if combined with strong deadline management it simplifies and builds confidence in the process.
Connections Portal	Order of scheduled activities – later software development	The project was setup for all workstreams to commence work at the same time and hit key stage gates at the same time. This had led to rework in both the portal and technical workstreams. It would have been valuable for the software development workstream to start several key milestones after both technical and commercial workstreams. This would have ensured that the scoping of software development was clearer from the start. Also it should be noted that workstreams should not align in deliverables if it does not make sense to do so, this would avoid unnecessary reporting and deliverable submission.

Lesson Type Category	Lesson Summary	Situation & Recommendations
Connections Portal	Value of upfront, easily accessible information	Early in the project we were informed by our stakeholder that the upfront application fee for a connection was prohibitive for customers approaching NG for a connection. We addressed this challenge by progressing UNC modification (0629s) which enables a Standard Design connection application to have a fixed fee of £13K. This is an 88% reduction from the current applicable application category which has a fee of £109K. Recommendation that upfront costs are reduced where possible to support customer cash flow and project viability.
Connections Portal	Mapping functionality	Visual functionality to clearly detail a situation has been positively received by all stakeholders. Being able to clearly see a customer site, connection point and pipeline information in one view has been well received. It is worth noting that clear scoping is needed for all visual software development – including complete and full wireframing practise.
Connections Portal	Simplified visualisation	A gas connection application is a complicated application form and elements of information, when visualised, led to poor user experience. Strong and wide reaching user testing is essential so that any common user experience challenges could be highlighted and improved before the next software iteration was released.
Technical Workstream	Value of standardised designs	Time and cost savings can be made from standardising where possible. Standardisation is our recommended technical approach as aside from predictable procurement orders, customer costs and fabrication timelines are also reduced. Standardisation also aides in engineer training and maintenance processes being simplified.
Technical Workstream	Improved understanding of enhancement opportunity	Project CLoCC commenced with a goal to better understand whether enhancement offerings would be of value to connection customers. Through stakeholder feedback the top 3 enhancements ranked were: Metering, Filtration and Gas Quality Monitoring. The lowest scoring enhancement was the offering of pressure reduction. See Project Progress Report 2 for further detail. The project recommends close engagement with stakeholders so that the direction of the project can be tailored appropriately. CLoCC decided to progress both metering and filteration designs, which will become free issue to customers.
Technical Workstream	Improved understanding of renewable telemetry kiosk opportunity	CLoCC looked at offering a minimum connection which does not require an external power supply and instead utilises a renewable power telemetry kiosk – this type of development was of interest to 86% of our stakeholders at our stage 2 stakeholder event. See Project Progress Report 2 for further detail. The project found that the renewable kiosk was underpowered for new digital risk and security updates required to protect the Gas National Control Centre. Consideration of an “upgrade” spend category so that innovation funds may be spent to upgrade previous works if benefit is evidenced

Lesson Type Category	Lesson Summary	Situation & Recommendations
Technical Workstream	Gas quality measurement requirements	To ensure gas safety and monitoring compliance, gas entering the network must currently be sampled at 20 pipe diameters up and downstream from an entry point. This incurs additional costs for a customer, including land purchase requirements in some cases. The project has been looking at how to reduce this customer cost and is currently, through our pilot customer opportunity, looking at ways in which a customer can demonstrate gas quality compliance within their site and before injection into the network. This activity is progressed via a GQ8 assessment and if successful could save customers additional cost. Information on gas quality monitoring can be found in the project's technical guidance document
Commercial Workstream	Value of process alignment	Our stakeholders strongly felt that it was important for the capacity allocation process to better align to that of the connections process in timeline. This learning has been heard by the project and addressed through incorporating, more than originally set out, the capacity application process into the newly developed connections portal. In this way, although separate processes, both capacity and connection applications can be applied for from the same platform and progress managed in a central location.
Commercial Workstream	Reduced upfront fees	Early in the project we were informed by our stakeholder that the upfront application fee for a connection was prohibitive for customers approaching NG for a connection. We addressed this challenge by progressing UNC modification (0629s) which enables a Standard Design connection application to have a fixed fee of £13K. This is an 88% reduction from the current applicable application category which has a fee of £109K. Recommendation that upfront costs are reduced where possible to support customer cash flow and project viability
Commercial Workstream	Gas quality specification blockers	100% of CLoCC stakeholders from the biomethane industry felt that the current oxygen specification of the NTS is a blocker to entry for their projects. Project CLoCC have fed this learning back into the business resulting in project CLoCC being one of the drivers for a National Grid Gas Quality Consultation which is forming future strategy. To tackle the blocker associated with oxygen specification the project has updated the National Grid Gas Ten Year Statement so that O2 content is assessed on a case by case basis. It should be noted that National Grid is engaged in wider industry conversations surrounding gas quality specification.
Commercial Workstream	Staggered UNC implementation and separate UNC modifications	Separating out UNC Modifications to achieve earlier implementation was worthwhile to ensure that customers can benefit from the non-ROV design solution as early as possible. This has avoided customers having to wait until the end of the project to benefit from CLoCC outputs.

Above is a summary of learning achieved by the project team. Should further information be required please do not hesitate to contact the project team using the contact details provided in Chapter 15.

Note to networks – the project team would like to support cross network lessons sharing. Please do not hesitate to contact the project team to discuss learning gained in further detail.

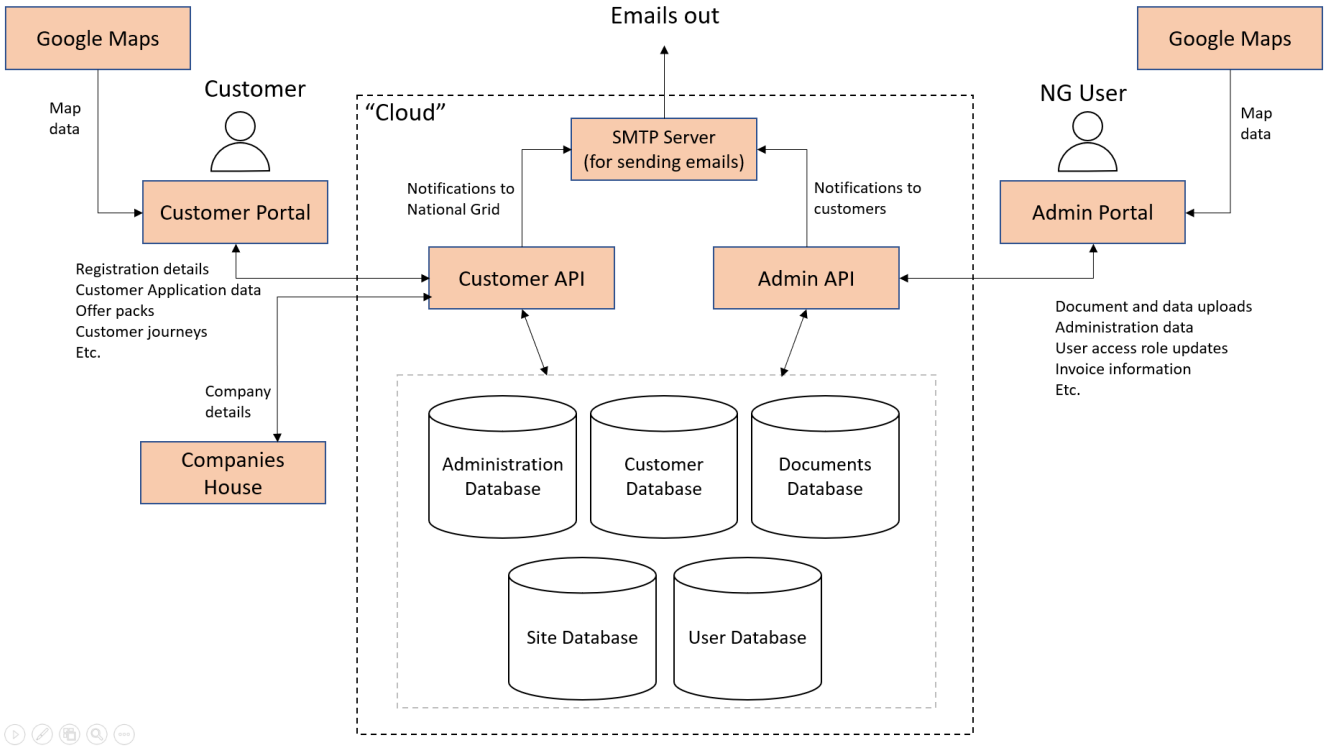
10. Project replication

The following section provides information on how this project could be replicated

10.1 Gas customer connections portal – replication

The following description explains at a high level how to replicate the design of the National Grid system. As with any software system, there are a multitude of ways to design and create a specific set of features, and the details below simply provide one example – the exact implementation of any similar system will depend upon the specific requirements of the user base.

The basic architecture of the overall portal system is shown in the following diagram:



The typical steps to recreating the system are as follows:

1. Creation of databases

A series of databases need creating to store the information used by the system. Although all of the data tables could be housed in a single database, in this instance, the data has been grouped and stored in separate databases. This is a security measure – access to each database can be controlled by a separate set of credentials, meaning access to one database does not provide access to all data in the system. Additionally, it enables the databases to be hosted on separate servers, thus providing a degree of separation, should any single database server be compromised.

Hosting data in separate databases also promotes scalability, should it be needed, allowing data and processing load to be shared across multiple servers.

When designing database schemas, consideration should be given to how the following features will be supported:

- Tracking administration activity for audit purposes
- Logging key dates for connection processing activities
- Making key parameters configurable – e.g. price range percentage, default cost estimate quota, text of letter templates.
- Making key data configurable – especially data that will be used to generate connection offer packs

2. Creation of existing site database

The “Existing Site” database contains a comprehensive list of existing AGI sites and associated data, such as their GPS coordinates, their connection capabilities and their scope for extensions.

This data for each site should include as a minimum:

- Site name
- Site location (GPS coordinates)
- Installation type (e.g. block valve, multi-junction, pig trap)
- Connecting pipework size
- Feeder number
- Suitability for standard design connection
- Connection capability (i.e. which connection types can it accommodate, with and without site extensions)

This is a significant analysis and data collation task, requiring meticulous information logging and review.

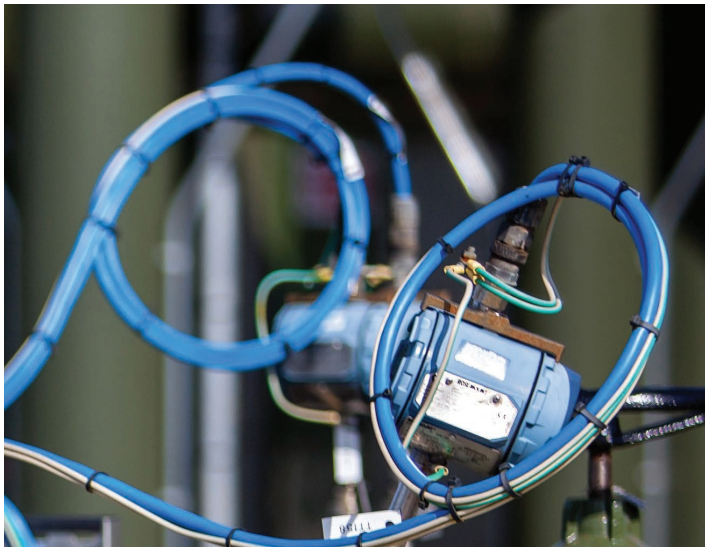
It is advisable that when devising the structure of the database tables holding this information that thought be given to the mechanism for entering and updating this data so that maintenance of this information can be kept as simple as possible.

3. Creation of cost database

A cost database would need to be created. This contains the costs for implementing each of the standard design connections. For each connection type, the prices can be broken down into whatever structure is appropriate for the provision of a connection offer. In the case of the CLoCC portal, the cost breakdown is:

- Materials
- Detailed Design
- Main Works Contractor – Build and Commissioning
- Staff Costs
- Project Services

In the case of this project, these costs were calculated towards the latter end of the project, after the standard designs had been created, and prototyped by the project’s technical workstream.



4. Creation of customer Application Programming Interface (API)

A mechanism to service data requests and data storage calls from the User Interface needs to be created. In this instance a "customer API" was developed to perform this function. This makes functions available to the customer portal, providing both access to data in the databases, and also processing logic that allows calculations to be performed.

High-level functions in the customer API include:

- Verification of company information via Companies House
- Storage of customer registration information
- Verification of customer log-on credentials
- Storage of basic standard design connection requirements
- Calculation of nearest AGI site to given GPS coordinates that matches basic connection requirements
- Retrieval of cost estimates based on standard connection requirements
- Retrieval of capacity information for specified sites
- Storage of standard connection detailed requirements
- Storage of bespoke connection/modification detailed requirements
- Storage of PARCA detailed requirements
- Upload of supporting files linked to applications
- Submission of application details
- Retrieval of application detailed data
- Retrieval of customer journey status
- Retrieval of offer pack files
- Upload of PDF documents

Since the user interface is a public internet-facing portal, the API needs to be capable of validating caller credentials to avoid malicious attempts to bypass the user interface security features.

5. Creation of the administrator API

The administrator API makes functions available to the administrator portal, providing access to the database and PDF document creation and merging functionality.

High-level functions in the administrator API include:

- Verification of user credentials
- Retrieval of application information
- Return application to "unsent" state and re-enable customer editing
- Lock application for review
- Upload of National Grid files linked to applications
- Saving of edited files
- Retrieval of standard document template information
- Storage of edited documents
- Creation, from edited templates, of PDF documents relating to an application
- Update of customer journey for an application
- Amalgamation of data and files relating to an application to create a composite PDF document
- Creation, update and deletion of existing site data (this needs to include site parameters and site drawing documents)
- Creation, update and deletion of cost data
- Creation, update and deletion of new administration users
- Update of user access rights
- Retrieval of access rights for current user
- Creation and update of invoices
- Creation, update and deletion of actions
- Retrieval of data for reports

As with the customer interface, the administrator user interface is a public internet-facing portal (albeit limited to specific National Grid staff), hence the API needs to be capable of validating caller credentials to avoid malicious attempts to bypass the user interface security features.

6. Creation of SMTP server

In order to notify customers of status updates, or to enable resetting of passwords, it will be necessary to be able to send emails from the system.

An internet-facing service needs to be created that can manage the creation and sending of emails. The key function made available on this server is the ability to send an email to a specified list of recipients. This must be accessible from the APIs that process the user interface calls.

7. Creation of customer portal

A customer portal would need to be created. This is an internet-facing user interface that provides all of the functions necessary for the customer to prepare and submit applications.

The portal would access the customer API functions in order to store and retrieve information from the databases.

Additionally, if the connection information is to be shown geographically, a link to a Geographical Information System (GIS) will be necessary. The portal created for the CLoCC project utilised Google Maps, but other map providers, such as MapBox could be used equally well. It should be noted that these map solutions can be used free of charge, provided the product developed is a free-to-use, publicly-accessible system.

It will be necessary to display the existing network as an overlay on the map. In this instance, the National Grid network was available as a shape file, which could be easily integrated into the system.

The key features of the portal would need to include:

- Customer registration screen
- Customer login screen
- Customer dashboard showing previous cost estimates and applications
- An option to create a cost estimate from basic parameters
- A display of the customer location on a map, with potential nearby connection points.
- Options to create standard, bespoke and PARCA applications.
- A series of screens to allow entry of detailed application data.
- A screen to show progress of an application (i.e. customer journey)
- A screen to display and allow download of connection offer packs
- A screen to allow upload of offer acceptance documentation

For data entry screens, consideration should be given to automating data entry and minimising repetitive entry of similar data. Where possible, data should be automatically linked (e.g. PARCA applications with connection applications)

8. Creation of administrator portal

An administrator portal would need to be created. This is an internet-facing user interface (to allow unlimited geographical access), but limited to use by your company only.

The portal would access the administrator API functions in order to store and retrieve information from the databases, and to generate the necessary documentation for connection offer packs.

The minimum viable features of the portal would need to include the ability to:

- Log-on using registered credentials
- View customer applications
- Return invalid applications back to customers
- Mark an application as under review (for processing)
- Upload documentation relating to an application
- View all files currently under preparation for a connection offer pack
- Edit letters to be sent to the customer as part of the connection offer pack
- Send the offer pack to the customer
- Manage the account status of registered customers (e.g. suspend or re-instate access)

Additional, recommended, features – each requiring its own screen – include the ability to:

- View applications geographically on a map screen
- Notify users of updates to their applications
- Control access to key functions by administrator staff
- Update all site information – this requires a series of screens to update connection capability, site drawings etc.
- Create and track invoices
- Create and track actions
- Limit the number of allowed cost estimates for each customer

Special consideration should be given to how the standing data in the databases will be maintained via the portal – for example site information, costing data, capacity information. It is recommended that some mechanism is created to allow the bulk upload or import of data from CSV files or spreadsheets.

If possible, wording templates should be configurable. Additionally, key values that affect the behaviour of the system should be made configurable, wherever possible.

10.2 Technical workstream – replication

Detailed designs have been produced to comply with the relevant National Grid specifications and NTS operating pressures which may not be applicable for other networks. The concept design of the modules could be replicated by other networks but in order for them to become approved for use on other networks they would require specific detailed designs which comply with the other networks own design specifications and maximum and minimum operating pressures.

The assessment of the suitability of new connections at existing sites is also specific to the transmission network assets but the assessment method could be replicated and an exercise undertaken to create network specific site assessment databases.

To replicate the technical work completed by the project the below list is recommended as a minimum:

- Design standards – identify the applicable gas network specific standards and wider industry standard.
- Basis of design – establish the basis of design for a minimum connection facility which complies with specific network standards.
- Design pressures – determine the pressure ranges which the standard connection modules will be designed to operate within.
- Existing site assessments – develop the criteria for determining what features a “suitable connection site” must include, including minimum space requirements, connection points, and when sites require further detailed investigation.
- Common connection points – determine what common pipework arrangements exist across the network of above ground installations that offer ready-made customer connection points.
- Selection of standard module sizes – module sizes can be selected based on the common connection point sizes or the customer flow rates. Avoid having standard designs of every pipe size and pressure range to keep the standard design option combinations to a practical level.

- Enhancements – establish early what the business appetite, commercial and legal position is for offering enhanced connections options.
- Commercial input – for a successful technical outcome the inputs of the commercial workstream are essential in order to keep objectives aligned.
- Portal logic – the portal relies on parameters and rules set by the technical workstream, ensure these are fully reviewed and accepted before being embedded into the portal logic.
- Technical stakeholders at the Network who have authority to accept designs into their standards libraries.
- Build – procure, fabricate and install example technical design at a suitable test location to support project learning regarding time and cost savings.

10.3 Commercial – replication

The commercial work stream of the project took a leading role in industry engagement to facilitate the technical and portal workstream deliverables and drive commercial improvements that were identified as most beneficial to our potential new customer base, such as reducing connection application fees.

Below is a list of the areas which are recommended for consideration by any other network licensee wishing to replicate the outputs delivered by this project's commercial workstream.

- Industry engagement – this is key to the success of commercial change implementation. Early engagement through key industry working groups and with key stakeholders is recommended, for example engagement with UNC working groups and attendance at ENA workshops.
- Ofgem engagement – if changes are required to your Transporter Licence then early engagement with Ofgem on this is essential.
- Key stakeholder and subject matter expert input – information and support from key stakeholders in the business is important to support changes and development of commercial options. An internal commercial working group was established which enabled these discussions to occur effectively prior to later decision making.
- Pilot customer – onboarding of a pilot customer helped with developing improvement to connection commercial contracts. Collaboration with our pilot customer also ensured that the customer's voice was at the forefront of decision making.
- Timely consultation – ensure strong contingency planning and allocate additional time in order to support any consultation activity required.
- Flexible scope – ensure that the commercial project scope is flexible so that key changes required by stakeholders can be practically achieved. Flexibility within this project allowed us to deliver capacity changes.
- Technical input – for a successful commercial outcome the inputs of the technical and other workstreams are essential in order to keep alignment between project workstreams.
- Limitation – look at potential limitations which may be caused by legislation. Project CLoCC had to limit our outcome on enhancement designs due to this.
- Implementation – start business implementation as early as possible. Ideally have any impacted teams on your internal commercial working groups to ensure a smooth transition.

11. Planned implementation

Ensuring that the goals achieved by the project team are fully realised in business as usual has been a key priority. It is critical that the online customer connections portal, a range of standardised connection designs and new commercial processes that reduce barriers to connecting for gas customers is embedded effectively within our business. Implementation plans began at the end of October 2018, when the project concluded and improvements are being considered by business as usual teams. Successful integration into the business will support our aim to make our network a more viable option for a new era of smaller distributed producers of gas, which will have an important role to play in decarbonising our gas network.

Portal Access for National Grid

The Gas Contract Management Team had full portal access from 29th October 2018 with the ability to directly support gas customer applications from the 30th October. From this date National Grid has been conducting additional live testing and the required cyber security testing prior to public release. The team have participated in a number of interactive training sessions in readiness for the go live dates, providing opportunity to raise questions and familiarise themselves with the portal. The team have responded to a number of enquiries from potential new customers since 30th October.

Portal Access for External Customers

Once appropriate security testing has been completed by National Grid the portal will be fully accessible for our customers. This is anticipated to happen from late January 2019. Access will be gained via the following link in the how to apply section of the National Grid website. https://www.nationalgridgas.com/connections/applying-connection

For any queries that the customer may have in advance of their application, they can contact the team at the following email address Box.UKT.customerlifecycle@nationalgrid.com

If you are interested in a new gas connection please contact National Grid for support. Box.UKT.customerlifecycle@nationalgrid.com

Standardised Design

The new connections portal will be generating standardised designs, this change will be reflected in the process that the teams will follow. A Conceptual Design Study previously created by external design houses, will now be available within the portal to form part of the Full Connection Offer. Necessary checks will be completed prior to issuing to the customer within a timescale of three months for National Grid to produce the offer pack.

Communication channels between the technical and commercial teams are formalised within the Administration section of the portal to ensure that technical checks and actions are completed in a timely manner.

UNC Changes

The Application to Offer process currently set out in Uniform Network Code has been updated to reflect the timescales that will apply when the project is completed. Construction Agreements and Standard Contract Terms have been revised along with updated clauses in connection agreements for new exit and entry points along with the suggested use of Long Lead Item contracts where necessary. A fixed fee has been introduced for a standard design connection, which will be payable on submission of the application. The Full Connection Offer will be issued from the Gas Contract Management team within three months if no feasibility study is required.

Technical guidance

Guidance has been provided to the business highlighting when a connection is suitable for a standard design solution and further detail has been provided around the methodology of the selection rules and calculations.

The automated selection process of a CLoCC connection is as follows;

- A connection with a flow rate less than 229.294 Scm/hr x 1000
- Type of connection Entry, Exit, Storage or Combined
- For assessment AGI site (block-valve, multi-junction, pig trap)
- For a new connection to the NTS pipeline

A software rule set has been disseminated to detail how the portal will allocate a connection to a suitable site; a list of rules are detailed below.

Suitable for generic connection? (yes/no/requires further investigation):

- **If No;** no connection is possible through the standard (CLoCC) connection types
- **If Yes;** then a connection is possible (as long as it fulfils the other rules)
- **If Requires Further Investigation;** then go to next viable connection type, but
  - If the connection is an entry/storage/combined it must be a "ROV connection"
  - If a new connection to a transmission pipeline is selected, the simplified connection is not a viable connection type

A Summary of Responsibility document will be available on the National Grid Gas Connections website detailing the requirements from the customer and obligations for National Grid. This will be utilised within the business and referred to in initial engagement with the customer, pre or post application.

Implementation plan

For each affected National Grid business area, a RACI has been created to highlight commercial, technical and portal streams where input is required. Ownership of deliverables will be confirmed by individual business units, including individual team ownership of developing new processes where required and team training. At a high level the CLoCC deliverables include:

CLoCC Workstream	Deliverables requiring handover
Commercial	• Awareness of completed new CLoCC specific UNC modifications and their effect. • Maintenance of gas transmission licence connection point table. • O2 risk assessment process input. • Application fee changes for connection & PARCA
Technical	• Maintenance of Existing Site Database held within the customer connections portal. • G19 designs created by CLoCC for use by National Grid for "Standard Design Connections". • Support for O2 risk assessment activities • Update and maintenance of technical documents that sit within or support the customer connections portal. • Update and maintenance of costs which inform indicative quotes produced by the customer connections portal.
Customer Connections Portal	• Use of the customer connections portal for all gas customer connections going forward. • Update and maintain various elements (tbc) of the portal in order to keep customer facing information current (e.g. FAQ information, gas quality monitoring & cost estimates). • Administration portal adhoc process and reporting activities.

Planned implementation

Lessons learnt

As we have progressed, there have been scenarios and activities identified as requiring further attention and improvements within the business. These have been discussed in a number of forums and will be formally captured in a Return to Business document which will be shared internally at the end of the project.

Improving timelines/Market intelligence

Going forward, National Grid will be able to utilise the data within the portal to drive further efficiencies and cost savings for customers. A clear indication of all connection costs within the administration portal will allow further analysis of any trends in cost profiles to be followed up and addressed. The portal will also provide a holistic view of customers that do not progress to the application stage from their initial enquiries which could subsequently be focussed on by the business.

As a result of the CLoCC Innovation Project, National Grid is taking the opportunity to review all other Application to Offer fees relevant to bespoke (non-standard design) connections, in particular the application fee relevant to Greenfield connections.

12. Learning dissemination

12.1 Mechanisms and outcomes of disseminating project CLoCC learning

Dissemination of Project CLoCC focussed on both external mechanisms to raise awareness with key stakeholders and audiences within the industry as well as internal dissemination within National Grid.

The mechanisms used to support dissemination of project outcomes are listed below.

1. External events/publications

Type	Date	Name of event	Evidence/outcome
Publication	August 2017	GI – IGEM's magazine	See Appendix J
Speaking/ presenting	March 2018	Gas Transmission Benchmarking Initiative European Committee – monthly meeting	Other attendees at the meeting included European gas transmission operators, interested in what Project CLoCC was delivering for the National Grid business and the lessons learnt. http://projectclocc.com/events/project-clocc-attended-gtbi-conference/
Exhibiting	2 May 2018	UK Biomethane Day 2018	Exhibited at the UK Biomethane Day on 2nd May 2018 and CLoCC business lead presented in the afternoon innovation slot http://projectclocc.com/uncategorised/project-clocc-attends-2018-uk-biomethane-day/
Exhibiting	22/23 May 2018	Utility Week Live	Exhibited on National Grid's Innovation stand at Utility Week Live on 22nd and 23rd May 2018

Type	Date	Name of event	Evidence/outcome
Attended	14 June 2018	Renewables Energy Association Awards	Shortlisted for the Renewables Energy Awards 2018 Innovation Award and attended the awards ceremony on 14th June 2018 http://projectclocc.com/events/project-clocc-nominated-for-innovation-award/
Exhibited	12 July 2018	Future Energy Scenarios Conference	Exhibited to delegates at National Grid's Future Energy Scenarios (FES) Conference on 12th July 2018 http://projectclocc.com/events/project-clocc-attends-future-energy-scenarios-conference-2018/
CLoCC event	20 September 2018	Project CLoCC Stakeholder Day	Held a Project CLoCC Stakeholder Day at National Grid's Eakring training facility. 27 stakeholders attended including representatives from distribution networks, Ofgem, European network providers such as Gas Networks Ireland, and potential NTS customers from biomethane, shale and electricity generation communities. The day gave an update on the project as well as offering a 'deep dive' into each of the project workstreams; technical, commercial and portal. The event generated significant amounts of positive feedback and raised discussion amongst stakeholders about the project. http://projectclocc.com/events/project-clocc-stakeholder-day-was-a-success/
Presenting and exhibiting	16/17 October 2018	Low Carbon Network Innovation Conference (LCNI)	Exhibited at the LCNI conference for two days and delivered a presentation to delegates on 16th October regarding the project's successes and learnings. http://projectclocc.com/events/lcni-2018/
Online publication	Ongoing	National Grid Connecting website	The project developed an article for the National Grid Connecting website for external and internal stakeholders http://nationalgridconnecting.com/connections-simplified-project-clocc/

For further details of attendance and speaking opportunities at events in 2017 and 2016, including the previous CLoCC Stakeholder Day, please see the previous three project progress reports on the Project CloCC website to access the August 2016, March 2017 and January 2018 project progress reports.

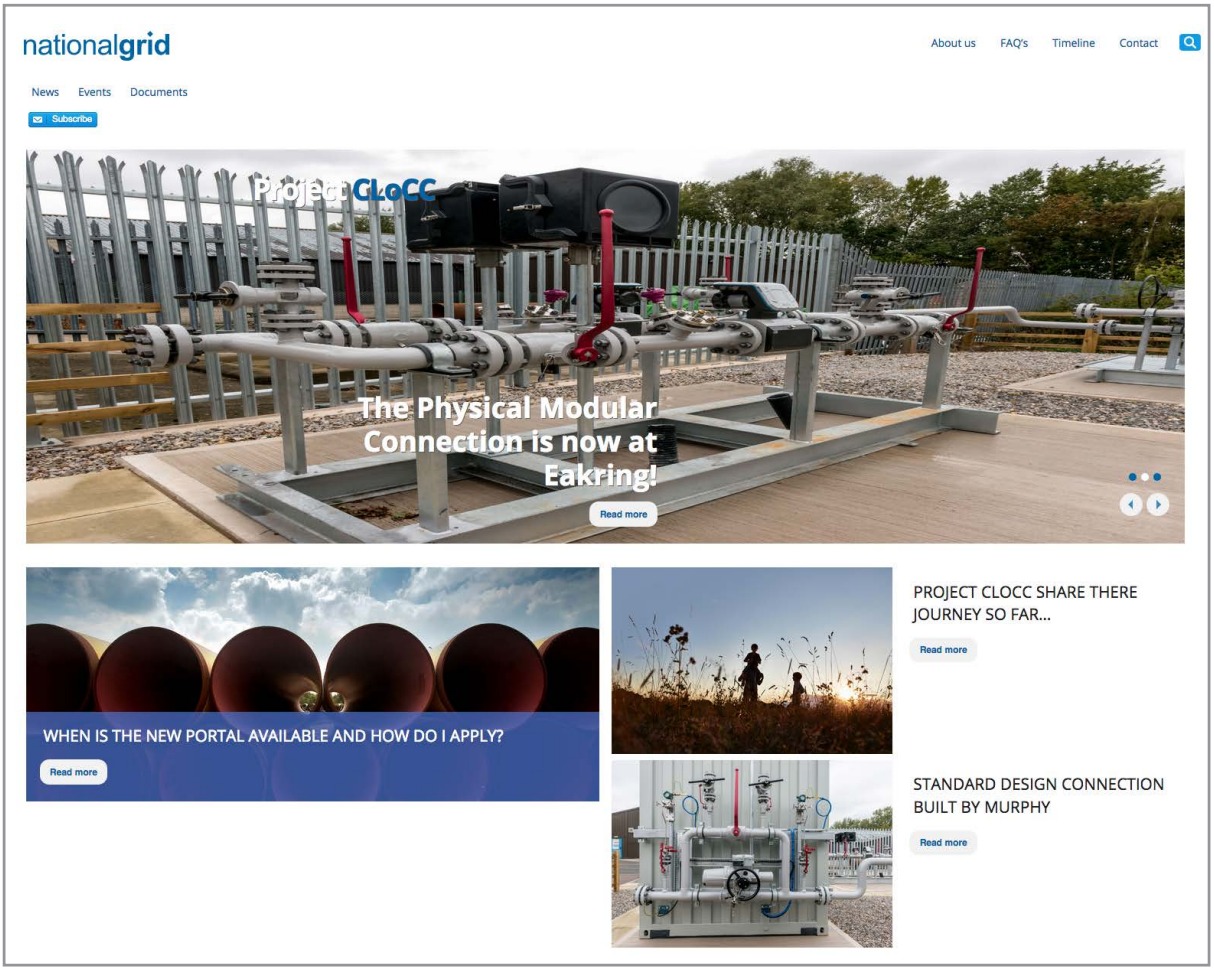
1. Digital mechanisms

The project has a bespoke website (www.projectclocc.com) as well as being listed on the National Grid website as an innovation project (https://www.nationalgridgas.com/insight-and-innovation/transmission-innovation/project-clocc).

Project progress has been disseminated on projectclocc.com since project inception. To date the project has posted 47 news items, 26 of which were published in 2018.

In terms of audience reach since January 2018:

- 1,400 users have visited the Project CLoCC
- generating an average of 1,900 sessions
- lasting an average of 2 minutes and 39 seconds
- 60% of visitors type the web address directly into a browser or link from the CLoCC email newsletter
- 27% of visitors use a search engine to find the page
- 8% of visitors find the website through social media links
- 5% find the website through links in other internet content



Since January 2018 there have been several spikes in website visits, generally triggered by specific activity such as:

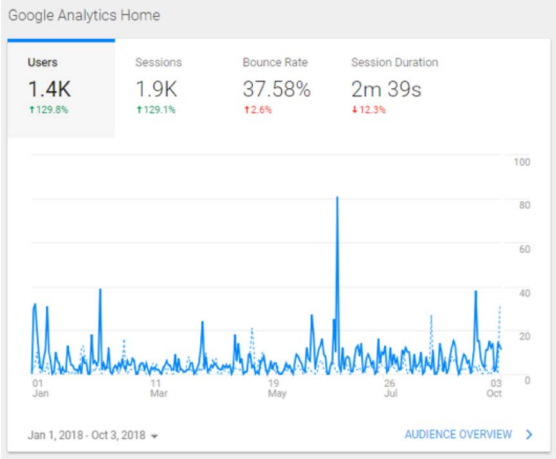
- Selection of our pilot customer opportunity in February 2018
- Issue of Project CLoCC newsletter in June 2018
- Stakeholder day information being issued in September 2018

- 27% of visitors use a search engine to find the page
- 8% of visitors find the website through social media links
- 5% find the website through links in other internet content

Since January there have been several spikes in website visits, generally triggered by specific activity such as:

- Selection of our pilot customer opportunity in February 2018
- Issue of Project CLoCC newsletter in June 2018
- Stakeholder day information being issued in September 2018

3. Internal National Grid mechanisms



Mechanism	Frequency	Name of event/publi-cation
Cross-business unit meetings	Monthly	Commercial Strategy Group meetings
Regular meetings	Ad hoc	Telemetry workgroup meeting
Regular meetings	Ad hoc	Capacity workgroup meeting
Publications	Monthly	Innovation Update newsletter
Publications	Ad hoc	SOundbites newsletter
Publications	Ad hoc	GTO newsletter
Publications	Monthly	Network Capability Operations Gas newsletter
Training	October 2018	Portal training day

Examples of some of the internal mechanisms the project has used can be found in Appendix J.

12.2 Feedback which has shaped the close down report

Feedback from stakeholders

The below table highlights the feedback we received from stakeholders at the first Project CLoCC stakeholder day in February 2016. This feedback helped shape the project direction and outcomes.

Feedback from Project CLoCC stakeholder day in 2016	Project CLoCC aims in light of this feedback	Project CLoCC outcome
NTS connections take too long & too expensive	Deliver connection solutions within 12 months & less that £1m	Mapped out customer journey and pilot customer will prove this concept.
We'd like more predictable costs	Develop a suite of standardised connections designs that will be pre-approved and pre-appraised	Worked with Premtech to deliver standard connection designs in 80, 200 and 300 mm nominal bore. Connection has been tested. Pilot customer appointed to prove these concepts.
We would like to be offered more services than just a Minimum Offtake Connection	Look to make filtration and metering options available	Worked with Premtech to facilitate this request. Completed build of meter and filtration skids.
Why do I need an ROV on my connection?	Review the ROV requirement for exit connections that meet our risk assessment criteria – this will help reduce connection costs	CLoCC facilitated the removal of the absolute requirement for an exit connection to have a remotely operable valve, which could save some customers more than £100,000. UNC mod
Why is the application fee so large?	Develop options for making applications through the connections portal cheaper	Application fee reduced by 88% for standard design customers
More payment flexibility would be very useful	Introduce the ability to phase payments	
We'd like to have more information on our connection progress	Incorporate customer "status" updates into our new online connections portal	Complete. This is highlighted as a customer status roadmap in the portal.
We need capacity and connection application processes better aligned	Incorporate the capacity process application into the new online connections portal with status updates on progress.	Capacity and connection information will both sit in the new connections portal.
The oxygen specification for connections to the NTS is prohibitive for biomethane entry projects	Look to allow the current specification for oxygen to be assessed on a case by case basis.	The National Grid oxygen specification is now more flexible allowing us to now consider applications up to the Gas Safety (Management) Regulations limit. UNC mod

Dissemination with network licensees

The following table shows the meetings and audiences we have shared Project CLoCC updates with since July 2017:

Meeting Title	In attendance	Date	Location	Purpose	Notes
Transmission Workgroup	Shippers/DN/ xoserve/ofgem	6 July 2017	Elexxon London	Introduce Project CLoCC	Link to 2017 meetings https://www.gasgovernance.co.uk/index.php/2017-meetings
Transmission Workgroup	Shippers/DN/ xoserve/ofgem	7 Sept 2017	Elexxon London	UNC Mod development	
Transmission Workgroup	Shippers/DN/ xoserve/ofgem	5 Oct 2017	Elexxon London	UNC Mod development	
Transmission Workgroup	Shippers/DN/ xoserve/ofgem	2 Nov 2017	Elexxon London	UNC Mod development	
Transmission Workgroup	Shippers/DN/ xoserve/ofgem	7 Dec 2017	Elexxon London	UNC Mod development	
Transmission Workgroup	Shippers/DN/ xoserve/ofgem	4 Jan 2018	Elexxon London	UNC Mod development	2018 meetings_ https://www.gasgovernance.co.uk/index.php/TX/2018
Transmission Workgroup	Shippers/DN/ xoserve/ofgem	1 Feb 2018	Elexxon London	UNC Mod development	
Transmission Workgroup	Shippers/DN/ xoserve/ofgem	1 Mar 2018	Elexxon London	UNC Mod development	
Transmission Workgroup	Shippers/DN/ xoserve/ofgem	5 Apr 2018	Elexxon London	UNC Mod development	
Transmission Workgroup	Shippers/DN/ xoserve/ofgem	16 May 2018	Elexxon London	UNC Mod development & Potential Licence changes	
Transmission Workgroup	Shippers/DN/ xoserve/ofgem	7 Jun 2018	Elexxon London	UNC Mod development	

Meeting Title	In attendance	Date	Location	Purpose	Notes
Transmission Workgroup	Shippers/DN/ xoserve/ofgem	2 Aug 2018	Elexxon London	Charging statement consultation specific	
ENA – Gas Futures Group	DNs, ENA	25 May 2017	ENA Offices	Share with DNs/ challenge and review	See Appendix L
ENA - Biomethane Networks	DNs, REA, ABDA, ENA, bio producers eg Air Liquide, Iona, Future Biogas, Grissan, Qila, Seven Trent, Oxford Capital, Greener for Life.	29 Aug 2017	ENA offices	Share with DNs/ challenge and review	See Appendix L
ENA- Biomethane Networks	DNs, REA, ABDA, ENA, Bio producers eg Air Liquide, Iona, Future Biogas, Grissan, Qila, Seven Trent, Oxford Capital, Greener for Life.	28 Nov 2017	ENA offices	Share with DNs/ challenge and review	See Appendix L
Gas Storage Operators Group	Vanessa Webster (EUA Chair), Ian Walker (UNIPER, Holford), Adam Leadbetter (Storengy, Stublach), Stewart Gilby (EDF ,Hole house), John Chambers (Scottish Power, Hatfield)	18 Sept 2017	National Grid House, Warwick	Discuss any concerns regarding gas quality and potential oxygen specification changes.	See Appendix L
ENA- Biomethane Networks	DNs, REA, ABDA,ENA, bio producers eg Air Liquide, Iona, Future Biogas, Grissan, Qila, Seven Trent, Oxford Capital, Greener for Life.	8 Mar 2018	ENA offices	Share with DNs/ challenge and review	
Operational Forum	Shippers/ operators	28 June 2018	National Grid House, Warwick	Promote Project CLoCC	2018 meetings_ https://www.gasgovernance.co.uk/index.php/TX/2018
UK Biomethane Day event	Biomethane developers/ DNs	2 May 2018	National Motorcycle Museum	Promote Project CLoCC	
ENA Gas Futures Group	DNs, ENA	27 Sept 2018	ENA Offices (dial in)	Project CLoCC Implementation update	

13. Key project learning documents

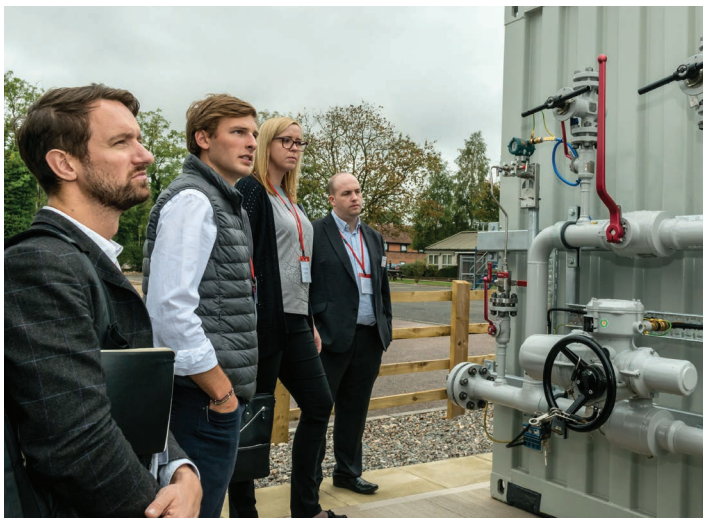
Project progress reports:

The following reports are the main documents the project has published to share learning:

1st progress report August 2016 – http://projectclocc.com/wp-content/uploads/2016/09/Project-CLoCC_Project-Progress-Report-1_August-2016_Final.pdf

2nd progress report March 2017 – http://projectclocc.com/news/progress-report-march-2017/

3rd progress report January 2018 progress report – http://projectclocc.com/wp-content/uploads/2018/01/Project-CLoCC-Progress-Report-3-Jan2018.pdf



Project CLoCC stakeholder events:

Date: 22 February 2016

Project CLoCC Stakeholder Day

Held a Project CLoCC Stakeholder Day at the Motorcycle Museum.

We invited stakeholders to learn more about our project and help influence our future direction with the opportunity to share opinions in discussions focused on our 3 project work streams.

Date: 20 September 2018

Project CLoCC Stakeholder Day

Held a Project CLoCC Stakeholder Day at National Grid's Eakring training facility. 27 stakeholders attended including representatives from distribution networks, Ofgem, European network providers such as Gas Networks Ireland, and potential NTS customers from biomethane, shale and electricity generation communities. The day gave an update on the project as well as offering a 'deep dive' into each of the project workstreams; technical, commercial and portal. The event generated significant amounts of positive feedback and raised discussion amongst stakeholders about the project. http://projectclocc.com/events/project-clocc-stakeholder-day-was-a-success/

Presentations

Date: March 2018

Gas Transmission Benchmarking Initiative European Committee – monthly meeting

Evidence/outcome:

Other attendees at the meeting included European gas transmission operators, interested in what Project CLoCC was delivering for the National Grid business and the lessons learnt. http://projectclocc.com/events/project-clocc-attended-gt-bi-conference/.

Date: 2 May 2018

UK Biomethane Day 2018

Evidence/outcome:

Exhibited at the UK Biomethane Day on 2nd May and CLoCC business lead presented in the afternoon innovation slot. http://projectclocc.com/uncategorised/project-clocc-attends-2018-uk-biomethane-day/

Date: 22/23 May 2018

Utility Week Live

Evidence/outcome:

Exhibited on National Grid's Innovation stand at Utility Week Live on 22nd and 23rd May 2018.

Date: 14 June 2018

Renewables Energy Association Awards

Evidence/outcome:

Shortlisted for the Renewables Energy Awards 2018 Innovation Award and attended the awards ceremony on 14th June. 2018 http://projectclocc.com/events/project-clocc-nominated-for-innovation-award/

Date: 20 September 2018

Project CLoCC Stakeholder Day

Evidence/outcome:

Held a Project CLoCC Stakeholder Day at National Grid's Eakring training facility. 27 stakeholders attended including representatives from distribution networks, Ofgem, European network providers such as Gas Networks Ireland, and potential NTS customers from biomethane, shale and electricity generation communities. The day gave an update on the project as well as offering a 'deep dive' into each of the project workstreams; technical, commercial and portal. The event generated significant amounts of positive feedback and raised discussion amongst stakeholders about the project. http://projectclocc.com/events/project-clocc-stakeholder-day-was-a-success/

Date: 16/17 October 2018

Low Carbon Network Innovation Conference (LCNI)

Evidence/outcome:

Exhibited and presented at the 2016, 2017 and 2018 LCNI conferences. Presentations focussed on disseminating project progress and learning to date. http://projectclocc.com/events/lcni-2018/

Date: Ongoing

National Grid Connecting website

Evidence/outcome:

The project developed an article for the National Grid Connecting website for external and internal stakeholders http://nationalgridconnecting.com/connections-simplified-project-clocc/

Date: August 2017

GI – IGEM's magazine

Evidence/outcome:

See Appendix J

SDRC documents

Date	Document
30 September 2016	Project process change report
30 September 2016	Project process change background information document
12 February 2018	9.4A – Buildability and Maintainability studies 9.4B – Detailed Drawing Packs covering: • Detailed Drawing Pack 1 – Minimum connection module solutions • Detailed Drawing Pack 2 – Telemetry kiosk • Detailed Drawing Pack 3 – Interconnecting pipework and simplified connections • Detailed Drawing Pack 4 – Combined connection module and kiosk (Skiosk) • Detailed Drawing Pack 5 – Filter module Detailed Drawing Pack 6 – Meter modu
17 July 2018	Aqua consultants User Acceptance Testing report submitted 17/07/18 – covering User Testing and End to End functionality testing.
28 September 2018	Factory Acceptance Testing (FAT) was carried out by Aughton Automation on 17/09/18.
29 September 2018	SAT / commissioning involved the end-to-end testing of the connection skid signals back to the National Grid Gas Control Centre, GNCC. This occurred on 19/09/18.
29 October 2018	All key databook information to support A Health and Safety File is included in the Murphy Partner Report Appendices ready for final incorporation, this will happen following installation of the minimum connection solution on the customer site.
20 October 2018	CLoCC final stakeholder event held at the National Grid training facility, Eakring. 27 attendees confirmed. See http://projectclocc.com/events/project-clocc-stakeholder-day-was-a-success/ for further information.
29 October 2018	Full final Project CLoCC application pack issued to NGG NTS for implementation into business as usual
29 October 2018	Production of a detailed final report to close down the project - this will include project findings knowledge and learning generated for distribution as per the dissemination strategy SDRC 9.11

14. Data access details

The publicly available data sharing policy for Project CLoCC can be found at:
http://projectclocc.com/documents/nic-data-sharing-policy/

15. Contact details

For queries relating to Project CLoCC please contact National Grid via:

Box.UKT.customerlifecycle@nationalgrid.com

16. Appendices and abbreviations

Appendices

Appendix A – Ofgem Direction

Appendix B – Scope summary

Appendix C – Standard design journey

Appendix D – Aqua Consultants project report

Appendix E – Premtech Ltd project report

Appendix F – Murphy Group project report

Appendix G – Stakeholder day feedback

Appendix H – Pilot customer documents

Appendix I – Lessons learnt log

Appendix J – Project communication dissemination

Appendix K – Project CLoCC progress reports

Appendix L – Commercial meeting notes

Abbreviations

20D	20 x pipe diameters up and downstream from an injection point
CLoCC	Customer Low Cost Connections
CDS	Conceptual Design Study
DNO	District Network Operator
ELD	Engineering Line Diagram
FCO	Full Connection Offer
G17	Distribution Network management procedure for the management of new works, modifications and repairs
G19	National Grid Procedure T/SP/G/19
GA	General Arrangement
GQ8	National Grid T/SP/GQ/8 Risk Assessment Procedure
GNCC	Gas National Control Centre
GS(M)R	Gas Safety (Management) Regulations
GT	Gas Transporter
GTYS	Gas Ten Year Statement
HA	Hazard Assessment
ICO	Initial Connection Offer
LOV	Locally Operated Valve
MOC	Minimum Offtake Connection
MTO	Material Take Off
MWC	Main Works Contractor
NB	Nominal Bore
NG	National Grid
NIC	Network Innovation Competition
NTS	National Transmission System
PARCA	Planning & Advanced Reservation of Capacity Agreement
RIIO	Revenue = Incentives+Innovation+Outputs
ROV	Remotely Operated Valve
RTU	Remote Telemetry Unit
SDRC	Successful Delivery Reward Criteria
SME	Subject Matter Expert
TRL	Technology Readiness Level
UNC	Uniform Network Code

nationalgrid

National Grid
National Grid House
Warwick Technology Park
Gallows Hill
Warwick
CV34 6DA
www.natioanlgrid.com