



# Capacity to Customers



# Capacity to Customers (C<sub>2</sub>C)

A trial of new technology and innovative commercial contracts to increase the amount of energy that can be transmitted through our network

## C<sub>2</sub>C releases extra capacity and delivers economic and carbon benefits

The project team worked with academic partners to prove that C<sub>2</sub>C could unlock capacity for demand and generation, producing an implementation model that can be adopted by other distribution network operators (DNOs). The project demonstrated that C<sub>2</sub>C can unlock real benefits for customers such as quicker new network connections at lower cost and cheaper distribution use of system (DUoS) costs.

## Our industrial and commercial customers are willing to sign up to C<sub>2</sub>C contracts

Customers were offered a monthly payment or a reduced new connection charge in exchange for allowing us to manage their connection in the event of a fault. During the project we signed up ten existing customers and ten new connection agreements.

## C<sub>2</sub>C improves our customers' power quality perception

We surveyed customers on the trial circuits to monitor the effects of C<sub>2</sub>C technology on power quality. Our findings demonstrated that the introduction of C<sub>2</sub>C did not have an adverse effect on overall customer experience and in many cases, it improved customer perception of their electricity service.

## What is C<sub>2</sub>C?

C<sub>2</sub>C trialled the use of new technology and innovative commercial contracts to increase the amount of energy that can be transmitted through our network.

The project ran from January 2012 until March 2015 and aimed to:

- Release previously untapped network capacity for everyday use
- Enable customers to make savings by changing the way they use electricity
- Reduce the need for network reinforcement
- Help meet the UK's tough low carbon targets.

## Technology implementation and effectiveness

As part of the C<sub>2</sub>C trial we examined the benefits of an alternative operating model for existing extra high voltage (EHV) and high voltage (HV) networks, which were enhanced with modern network automation functionality. Specifically at HV, C<sub>2</sub>C closes the normally open point (NOP) between two adjacent HV circuits to form a closed HV ring and release the inherent 'capacity to customers'.

**360 HIGH VOLTAGE CIRCUITS WERE SELECTED FOR THE TRIAL SERVING 12% OF THE NORTH WEST'S ELECTRICITY CUSTOMER BASE**

We retrofitted existing infrastructure with low cost, proven remote control technology at key locations on the ring.

This equipment allowed us to reconfigure the network in the event of a fault, which enabled us to rapidly re-energise customers' supplies and minimise the need to activate demand and/or generation side response contracts.

We tested the effectiveness of the technology by installing monitoring equipment on the trial circuits, which collected real time data from the network. This allowed us to monitor actual performance and informed a series of network simulations and modelling exercises.

The fault management system architecture and process that we designed and embedded was effective during the trial. We successfully demonstrated automatic network segregation and fault sectionalising for faults occurring on trial networks. We also showed that C<sub>2</sub>C has the ability to prioritise and restore multiple managed customers through a detailed testing schedule. The direct real time management of customer loads during the trial was successfully proven through a suite of automation solutions comprising supervisory control and data acquisition (SCADA) systems and a range of EHV/HV/LV switches or moulded case circuit breakers (MCCB). These enabled us to control either all, or part of a customer's load in accordance with the managed connection agreement.

“C<sub>2</sub>C can unlock real benefits for customers”



## Customer engagement - impact on customers

The change in operating arrangements on C<sub>2</sub>C circuits could potentially increase the number of short duration interruptions experienced by all customers; as closing the NOP to form a closed ring generally doubles the number of customers affected by a fault. However, the new operating regime was proven to deliver a shorter interruption to supply than under normal operating arrangements. It was therefore essential to carry out extensive customer engagement, throughout the trial, to understand the impact on overall customer experience.

We conducted detailed customer research with a sample of customers in the trial area to understand any relative shift in overall customer experience, looking at power quality, interruption frequency and duration.

The results of this engagement demonstrated that the change in operating conditions did not adversely affect customer perception of their electricity service. In some cases customers' perception was more favourable for all three key power quality measures: frequency, duration and dips and spikes.

We also convened an engaged customer panel to explore the extent to which customers understood C<sub>2</sub>C, its benefits, any perceived barriers to its success and whether domestic customers needed to be informed about the

trial. This panel helped formulate effective communication plans, which resulted in the publication and circulation of a leaflet to all customers on the trial circuits before the trial started.

## C<sub>2</sub>C commercial customer engagement

To realise the capacity benefits that C<sub>2</sub>C can offer requires new and/or existing customers to adopt new forms of commercial arrangements. The trial area affected 12% of our customers, of which approximately 1,200 were industrial and commercial (I&C) customers. We contacted all of our I&C customers on the selected circuits directly, to test their appetite for these new commercial contracts.

MANY I&C CUSTOMERS FOUND THE C<sub>2</sub>C CONCEPT **APPEALING** & WOULD CONSIDER A C<sub>2</sub>C CONTRACT

Our project partner, Impact Research, gathered and collated a segmented database from our customer data systems then cleansed and enriched the data to provide a holistic and meaningful view of the trial area customers. We then issued a bespoke mailing, containing a leaflet and video, to all 1,200 customers. A total of 180 questionnaires were completed by I&C customers from 12 July to 10 August 2012 either through online self completion or by telephone interview.

The research explored various elements of the contract including: the maximum number of managed interruptions per year; the maximum cumulative interruption duration per year; the payment method; the length of contract; the number of safeguarded days and various levels of payment. Key findings from our research showed:

- Many I&C customers found the C<sub>2</sub>C concept appealing and 31% stated they would recommend their organisation consider a C<sub>2</sub>C contract
- Contracts need to be carefully tailored to the needs of individual customers, with a range of customisable contract elements offered to make them as attractive as possible
- An increase in financial reward was found to outweigh all other factors, particularly the inconvenience of longer durations.

## Commercial framework for demand side response

To extend the benefits of C<sub>2</sub>C to all DNO customers, we developed new commercial templates to provide post-fault demand side response (DSR) for new and existing demand and/or generation customers. The development of these new arrangements was supported by the substantial customer engagement exercise described above.

The survey provided a significant insight into I&C customers' appetite for C<sub>2</sub>C and is detailed in the customer segmentation report that was published on our website in June 2012.

Having completed the extensive customer engagement exercise, new commercial contracts were developed and brought to market. These were subsequently tested with new connection and existing customers. These contracts are proven modifications to existing industry framework contracts and are intended to offer significant benefits for customers over traditional demand side response formats, being less intrusive and provided at lower cost. These agreements were published on our website in December 2012.



These commercial templates were successfully applied to the 20 C<sub>2</sub>C trial participants. For the ten new connections customers, the total customer contributions for a traditional solution would have been £7.84m compared to £0.37m for a C<sub>2</sub>C contract – representing a saving of £7.47m for customers from the avoidance of reinforcement costs. The I&C customer sectors involved in the trial were covered by demand and generation managed contracts and ranged in capacity from 500kVA to 10,500kVA.

## P2/6 security of supply

A key element of the C<sub>2</sub>C project was to explore the interaction between DSR services and existing industry policy, more specifically the network planning requirements in ER P2/6. This stipulates the security of supply to customers based on the aggregation of their demand as it appears on the network. In its simplest form, the recommendation sets out the amount of capacity that must be available on

the network for specified demand thresholds, so that demand can always be supplied when capacity becomes unavailable due to a fault or a planned outage.

As C<sub>2</sub>C uses the inherent latent capacity specified as a requirement of ER P2/6 for the connection of new demand, there will be instances, following an outage and prior to network switching, when customers' unconstrained demand cannot be supported. This will lead to potential non-compliance under the current framework. For the purposes of the C<sub>2</sub>C trial a derogation from the requirements of P2/6 was granted for all demand groups supplying the trial circuits.

The remit of this area of work within the project was to present a recommendation for how DSR could be accommodated within ER P2/6, and provide a consistent and practical approach for the industry to follow when assessing the contribution of DSR to security of supply assessments.

It was proposed that:

- In the short term an appropriate allowance for DSR should be taken into account when calculating group demand or by adjusting network capability. It is up to each DNO to justify and formally record its approach for each DSR connection.
- It is up to each individual DNO to decide on the percentage of DSR that it will take into account when calculating group demand and this value should be recorded.
- At the time of project closedown it is the view of the industry that for EHV networks the gross level of demand (group demand plus the responsive demand) should be curtailed to ensure that the system is able to maintain supplies to customers while responsive demand is disconnected.

## Business as usual

Capacity to Customers has now been successfully integrated into our business as usual (BAU) processes, and is known as 'managed connections'.

From 1 July 2016 all generators above 200kW applying for a new connection with Electricity North West are offered a managed connection. To adopt managed connections into BAU, we have updated all relevant policies, changed our business processes, drawn up new contract templates and briefed all colleagues affected by the change.

Our first BAU demand side response agreement was signed with United Utilities, as an alternative to installing a new transformer at one of our primary substations. If a fault occurs, United Utilities will remain off supply for up to eight hours, to allow us to restore supplies to the majority of customers connected to this primary substation and to repair the fault. The agreement covers up to six events, over the three-year agreement period and secures over £4 million of efficiencies.

C<sub>2</sub>C is the first of our larger innovation projects to start transforming how we offer new services and value to our customers. Over the next few years we expect to see many similar changes as our projects progress from areas of research to become business as usual.



“ Our first agreement secures over £4 million of efficiencies ”

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