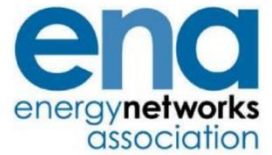


The Voice of the Networks



Energy Networks Association

Open Networks Project

Guidance on Post Connection Changes

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Executive Summary

This product focuses specifically on the approach to requests to make changes after a site is connected. Other products cover earlier stages in the process.

Such requests could include, changing the distributed energy resources (DER) technologies connected at a site, changes to Maximum Export Capacity (MEC)/Maximum Import Capacity (MIC) and changes to the provision of flexibility services and/ or operational regimes for example. Such changes could impact local network operation and other users.

Customers request a connection from their network operator and provide information as set out in the Electricity Act 1989.

In response to receiving this information a distribution network operator (DNO) must make a connection offer to the customer. If that customer accepts the connection offer they will subsequently be required to enter into a Connection Agreement which sets out the terms for the connection to remain connected to a distribution network; the same arrangements exist for IDNOs, whilst noting that an IDNO connecting to a DNO has a Bi-lateral Connection Agreement with the DNO.

The connection to and day-to-day operation of electricity networks require network owners/operators (and connectees) to comply with both primary legislation (the Electricity Act and Statutory Instruments) and secondary legislation in the form of Electricity Distribution Licence Conditions.

Any actual or proposed replacement, renovation, modification, alteration or construction is required to be notified to the DNO.

As the dynamics of electricity networks continues to change and those connected to those networks seek more active participation then it is likely that requests to make alterations and/or modifications to existing connections will become more prevalent.

Key recommendations for good practice include:

- DNOs should consider making better provision for customers to request alterations or modifications to their connection on their websites and application forms.
- DNO websites need to provide easily accessible information to customers considering making changes to an existing installation. Application forms and the application process should be amended to make requesting changes clearer and easier.
- Connection Agreements should ideally be reflective of the equipment installed and hours of operation of customers' equipment on the connected site where appropriate
- Customers shall ensure they are aware of the requirements of their Connection Agreement and seek clarification from the DNO if required
- Customers should contact their DNO to discuss any changes to their existing installation prior to proceeding.

Introduction

This document is the output of Open Networks project, Workstream 2, Product 6 which covers:

Guidance on Post Connection Changes - Provide guidance to customers on the impacts of changes to DER operational regimes. Agree when and how changes should be notified to DNOs.

This product focuses specifically on the approach to requests to make changes after a site is connected. Other products cover earlier stages in the process as shown in the diagram below.

WS2 Product 6 coverage					Product 6 Good practice guide
Stage in connection timeline	Application management (Pre-application)	Offer management (Post-application, pre-offer)	Interactivity management (Post-offer, pre-acceptance)	Queue management (Post-acceptance, pre-connection)	Operational management (Post-connection)
Capacity in pipeline		Potential network capacity requirement	Network capacity offered	Network capacity contracted	Network capacity used
2018 product number	WS1:7 WS2:1,3,4	WS1: 9,10,11 WS2:5	WS1: 9,10,11 WS2: 5	WS1: 9,10,11 WS2: 5	WS1: 8 WS2: 2,6,7
Queue management requirements	Information provision A&D charges	Allocation of start date, continued information provision. Allowable changes. Network studies to determine capacity	Interactivity, allowable changes	Allocation of post-acceptance queue position. Management of timely progress/milestones, allowable changes	Management of capacity utilisation, review of constraints constraint information

Such requests could include, changing the distributed energy resources (DER) technologies connected at a site, changes to Maximum Export Capacity (MEC)/Maximum Import Capacity (MIC) and changes to the provision of flexibility services and/ or operational regimes for example. Such changes could impact local network operation and other users.

A separate piece of work by the DER Connections Steering Group considers changes made during the earlier stages of a project. This piece of work refers to allowable (previously material) changes.

Background

Customers request a connection from their network operator and are required to provide three key pieces of information as set out in the Electricity Act 1989. They are required to specify (not verbatim from the Act):

- The premises/site
- The size of connection required, and
- The date on which they'd like the supply available.

This information, together with additional detail, enables the network operator to assess the impacts on the network and other customers and make a connection offer to the customer. If that customer accepts the connection offer, they will subsequently be required to enter into a Connection Agreement (larger connections typically at HV (high voltage) or EHV (extra-high voltage)). Smaller connections are covered by the National Terms of Connection (NTC). A Connection Agreement sets out the terms for the connection to remain connected to a distribution network; the same arrangements exist for customers connecting to Independent DNOs. An IDNO has a Bi-lateral Connection Agreement with the DNO.

Making a new application

When customers make a request for a new connection to an electricity network they are required to provide three key pieces of information as outlined above. To enable a DNO to assess the request fully, additional information is typically required and customers are required to complete DNO specific application forms. DNO application forms set out the additional information required and in the case of the generation connections specifically, ENA application forms for G99 are considerably more detailed.

The information in the application form is used to design a new connection point to the network.

Designing a connection point

Electricity networks are by their very nature dynamic. Across the whole of the United Kingdom hundreds of new connections are made on a daily basis. Each new application can have an impact on the electricity network and in areas of high utilisation applications may become interactive. When an application for a new connection is made the DNO needs to undertake a full network assessment which will normally consider the following

- Existing connected customers
- Customers in the application queue (enquiry to quote issued) and
- The technical ability of the network to accommodate the new connection point

A quotation is issued by the DNO setting out both the price of the work as well as any physical work required to make the new connection.

Making an application to modify an existing connection

From a customer perspective the process for making modifications to an existing connection are neither as well defined nor as clear as for a new connection application. Most, if not all, DNO websites refer to new connections and typically customers are encouraged to use the new connection process when seeking to make modifications to an existing connection.

Whilst a DNO may still need to undertake a full network assessment to determine the acceptability or otherwise of the request there may be instances where the proposed modification can be a permitted without the need to issue a quotation for any new work to be undertaken.

Connection Agreements/Bi-lateral Connection Agreements

A Connection Agreement sets out the rights (of the customer) to remain connected.

DNOs have implemented differing versions of the model form Connection Agreement (from DCUSA) each setting out different information and placing slightly different requirements on Users.

Generally Connection Agreements contain specific details of the assets connected at the point of connection, which are gathered during the application process.

Customers are required to enter into a Connection Agreement before a connection is energised and if and when alterations are made to the equipment connected at the connection point.

The Connection Agreement forms part of Distribution Connection and Use of System Agreement (DCUSA) which is further explained below.

Legislation and legal framework

The connection to and day-to-day operation of electricity networks require network owners/operators (and connectees) to comply with both primary legislation (the Electricity Act and Statutory Instruments) and secondary legislation in the form of Electricity Distribution Licence Conditions.

Items of legislation and legal framework include The Electricity Act, the Distribution Code and DCUSA.

Appendix 1 contains details of relevant sections/parts of these documents which make reference to modifications.

Impact of new or modified connections

Electricity networks were traditionally designed for the flow of electricity in one direction typically from fossil-fuelled power stations through the transmission and distribution networks to end user customers. The move to a lower carbon economy has seen significant quantities of smaller generators connecting to distribution networks such that electricity flows are often bi-directional and the direction of flow can often vary at different times of the day. DNOs are responsible for ensuring the development of efficient and co-ordinated networks and managing the day to day operation of the network.

Different types of customers present different challenges to the network and each connection (new or modified) can further impact the network. For example a bakers in typical high street is likely to use the largest proportion of its energy during the early hours of the morning when baking its goods. Conversely a hairdressers is most likely to use the largest proportion of its energy later in the day when hairdryers are being used and water is being re-heated. Electricity networks are designed taking account of such diversity. The same is true of generation connections. Solar farms typically generate electricity when the sun is shining and wind farms generate when the wind is blowing – rarely does the sun shine and the wind blow in the same area at the same time.

New or modified connections can impact:

- Existing customers already connected to the network

- Earlier applications for connection to the same piece of network
- The technical capability of the network and
- Upstream networks be they IDNOs, DNOs or the transmission network

It is essential therefore that both new application requests and requests to alter or modify an existing connection arrangements are discussed and notified to the DNO – which the legal framework supports.

Good Practice

As described above the legal framework requires that any change to the equipment at an existing connection must be notified to the DNO. DNOs acknowledge that this position has not been rigorously enforced in the past and that maintaining this position going forward is not sustainable.

In recognition of this, DNOs should seek to develop and provide clearer and consistent guidance to customers wishing to make changes to the equipment at their site/connection. DNO websites should have dedicated pages for customer wishing to modify their connection. These pages should provide reference to the legislative requirements, as well as links to relevant supporting documentation.

DNOs should provide sufficient information and support to enable customers to determine whether or not they should request a new or modification application. DNOs should develop methodologies to allow customers to make a simplified application when seeking to make modifications to their existing connection. This could be by way of shorter more relevant application forms.

Current application forms are geared towards new connections – DNOs should consider making better provision for customers to request alterations to existing connections on their websites and application forms.

Connection Agreements should detail the equipment connected at a site (as built/as installed) and not the equipment mentioned in the original application form.

Some common scenarios together with possible network impacts and the reasons for notifying the DNO are covered below.

Illustrative examples

a) Change to MEC, MIC, fault level or harmonic contribution

This example covers changes to the agreed Maximum Export or Import Capacity and or changes to fault level or harmonic contribution.

Decrease of MEC, MIC, fault level, or harmonic contribution

A decrease in MEC, MIC or fault level or harmonic contribution is often (but not always) likely to have a positive impact on an electricity network. The plant and cables which make up electricity networks have maximum capacities and should these be exceeded additional plant/cables are often required to accommodate higher capacities. Typically reductions therefore are welcome. However if generation has been permitted to connect on the basis that there is sufficient demand on the network and that demand then reduces this could have a serious impact on reverse power flows and may in fact cause design capabilities in the

reverse direction to be exceeded. It is unlikely that a DNO would not allow a customer to reduce/change their MEC, MIC, fault level or harmonic contribution but it is essential that such changes are at least discussed with the DNO in the first instance.

Increase of MEC, MIC, fault level, or harmonic contribution

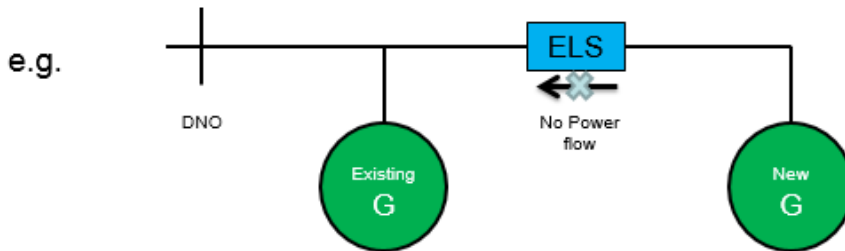
An increase in MEC, MIC or fault level or harmonic contribution is often (but not always) likely to have a negative impact on an electricity network. The plant and cables which make up electricity networks have maximum capacities and should these be exceeded additional plant/cables are often required to accommodate higher capacities. A request to increase may have an impact on existing connected customers, it may have an impact on customers that have already made connection requests in same area and it may have a negative impact on the electricity network itself. (If however, the increase is within the agreed service capacity and or maximum power requirement it is possible that the changes can be accommodated and that the existing Connection Agreement will need to be changed to reflect the new capacity only).

It is essential that such changes are at least discussed with the DNO in advance.

b) Change of Total Installed (Generation) Capacity (TIC)

There are two possible scenarios here. Firstly, a change in TIC that does not impact power export or import and secondly a change in the TIC that does impact power export or import.

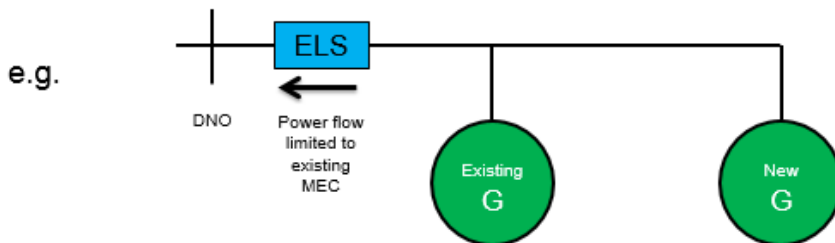
Change in TIC that does not impact power export or import



ELS = Export limiting scheme

In the example above, the MEC remains the same and power and export profiles also remain unchanged.

Change in TIC that impacts power export or import



In the example above, the MEC remains unchanged however exported power increases.

Both of these examples have the potential to impact on existing connected customers, they may have an impact on customers that have already made connection requests in the same

area and they may have a negative impact on the electricity network itself. Such alterations and or modifications should therefore be discussed with the DNO. If after undertaking a network assessment the changes cannot be accommodated without the need to undertake works, it is likely that a quotation will be issued for any new works that may be required. If however the changes can be accommodated on the existing electricity network modifications may only be required to the Connection Agreement.

However, in example b, in Northern Ireland this can be treated as an “over install” and can be facilitated through a modification request and subsequent amendment to the Connection Agreement if

$$\text{TIC} = <\text{MEC} + 20\%$$

c) Change of generator (of same size and technology type)

This example covers the situation where the generator is to be changed for one of the same size and technology type - typically where a generator may have faulted and is being replaced. Such changes are unlikely to affect other customers, other applications in a connections or the network but in accordance with the legal framework such changes should be notified to the DNO.

d) Change to technology type/mix of technologies

Diversity allows DNOs to efficiently allocate network capacity and connect more customers to the network. Not all customers utilise their connection at the same time or do the same thing (import or export) at the same time.

A change to generator technology type typically means a change of the export profile. Therefore any change of technology that would affect the export profile, fault level or other significant factor, will most likely impact upon other connected customers, customers in a connections queue and quite possibly the electricity network. It is likely that the network connection assets (DNO equipment) will be able to accommodate the new technology; however, the issue is the wider system capacity for different or similar generation types.

Such changes should be discussed with the DNO.

e) Change to import/export profiles

The design of a new connection to an electricity network is based upon the original details set out in the request/application. This will include the import/export profile. This information is requested in part 2 of the new ENA application form for G99. An example might be a generator that originally planned to export during the morning but then wishes to change to export during the afternoon or for a demand connection it might be a factory that changes from daytime operation to 24/7 operation.

Similar to d) above the connection assets will almost certainly be able to accommodate the change, but the issue is likely to be the impact on the wider electricity system, customers already connected to it and customers in a connections queue.

A connection that is covered by a Connection Agreement will contain details of the type of equipment and the associated utilisation profile. Any planned change/modification to the utilisation profile therefore will need to be notified to the DNO for a full network assessment. Depending on the outcome of the assessment a new connection application may also be required.

f) Change to (flexibility) services provision

With increasing levels of DER, more services are being sought from these resources. These services include balancing services to National Grid and local (flexibility) services to DNOs. DNOs are beginning to procure flexibility services in the four possible scenarios where service characteristics are defined by WS1 Product 2.

Service Characteristics	Scheduled Constraint Management	Pre-fault Constraint Management	Post-fault Constraint Management	Restoration Support
When to act	Pre-fault	Pre-fault	Post-fault	Post-fault
Triggering action	Time	DSO forecast; or Asset Loading	Network Fault	Network Fault
Certainty of utilisation	Very certain	Uncertain	Uncertain	Very uncertain
Efficiency of utilisation	Low	Medium	High	Low
Risk to network assets	Low	Medium	High	Low
Frequency of use	High	Medium	Low	Low

As customers seek to play a more active role in the energy market this is one area where DNOs are likely to see an increase in the number of requests. Given the four DNO service scenarios above it is highly likely that the connection (for flexibility service provision) will be time-bounded both in overall duration and in the time of day the service is required. Providers will seek to maximise their return and may well look to provide multiple services to multiple organisations. Before providing any additional (flexibility or balancing) services customers should in the first instance discuss with their DNO. If additional connection assets are required a quotation will be issued. Otherwise it may be possible to amend the Connection Agreement.

g) Change from flexible connection to an unconstrained connection

As distribution networks have become more constrained largely due to the number of generation connections DNOs have sought to offer innovative solutions to allow generators to connect at economically viable prices. In exchange for a cheaper connection, DNOs manage the generator output within network limits via Active Network Management systems (or other managed arrangements).

The concept of Active Network Management is that electricity produced or consumed by network customers is variable, and that DNOs can make use of that variability to optimise the use of network assets.

Customers signing up to such an arrangement typically enter into a specific Connection Agreement which set parameters of the connection and the conditions under which output could be varied.

Electricity networks are by their nature dynamic and DNOs recognise that customers with a flexible connection may wish to opt for an unconstrained connection at a later date. Should they wish to do so then a new application for an unconstrained connection will be required.

h) Change to Bilateral Connection Agreement

When an offer for connection to a distribution network is made by a DNO and it is subject to Statement of Works (SoW) or subject to the customer entering into the relevant agreement with NGET (e.g. BEGA (Bilateral embedded generation agreement) or BELLA (Bilateral embedded licence exemptible agreement for certain sized generation connections in Scotland)), then this should be viewed as a condition of the distribution connection offer. Should the customer choose not to accept these terms (or subsequently terminate their BEGA or BELLA for example), they have no valid agreement in place.

If parties accept their distribution connection offer, but then choose not to accept any additional costs, works etc. required as a result of the SoW assessment then by doing so their agreement with the DNO is effectively invalid. To do otherwise would mean capacity is being reserved. As well as potentially reserving capacity, the connecting party runs a considerable risk of not getting access at a future date due to more onerous constraints/requirements from transmission. Should this occur the customer would be required to make a new application to the DNO for a revised connection offer.

In addition to impacting other distribution connected customers, changes made at distribution level can also have a detrimental effect on the upstream transmission network. Although unlikely it is possible that a subsequent SoW request will be required.

Such situations should be discussed with the DNO.

Recommendations

- DNOs should consider making better provision for customers to request alterations or modifications to their connection on their websites and application forms.
- DNO websites need to provide easily accessible information to customers considering making changes to an existing installation. Application forms and the application process should be amended to make requesting changes clearer and easier.
- Connection Agreements should ideally be reflective of the equipment installed and hours of operation of customers' equipment on the connected site where appropriate
- Customers shall ensure they are aware of the requirements of their Connection Agreement and seek clarification from the DNO if required
- Customers should contact their DNO to discuss any changes to their existing installation prior to proceeding.

Appendix 1: Legislation and legal framework

The Electricity Act 1989 states in 16.4

– (4) *In this section and sections 16A to 23 —*

- (a) any reference to making a connection includes a reference to maintaining the connection (and continuing to provide the necessary electric lines or electrical plant);*
- (b) any reference to requiring a connection includes a reference to requiring the connection to be maintained (and the continued provision of the necessary electric lines and electrical plant); and*
- (c) any reference to the provision of any electric line or electrical plant is a reference to the provision of such a line or an item of electrical plant either by the installation of a new one or by the modification of an existing one.*

Both primary and secondary legislation govern everything concerning electricity networks including compliance with the Distribution Code (D-code) and requests to make changes/modifications post connection.

Distribution Code and Distribution Connection and Use of System Agreement (DCUSA) are two of the main documents mentioned in the Distribution Licence:

- DNOs are bound by the Licence Condition 21 (of their Distribution Licence) to have in force and implement and comply with a Distribution Code (D-code). It covers all material technical aspects relating to connections to and the operation and use of the DNO's Distribution System and the operation of electric lines and electrical Plant and Apparatus connected to the DNO's Distribution System.
*DPC8.2.2 states - In addition to periodic updates of planning information a **User** should give adequate notice of any significant changes to the **User's System** or operating regime to enable the **DNO** to prepare its development plan, budget for, and implement any necessary **System** modifications. Such information should include any changes either increasing or decreasing in **Demand**, transfer requirements or generating capacity as appropriate. In the event of unplanned changes in a **User's System** or operating regime a **User** shall notify the **DNO** as soon as is practically possible to ensure any contingency measures, as necessary, can be implemented by the **DNO**.*
- DCUSA is a requirement of Distribution Licence Condition 22. It is a multi-party contract between licensed electricity distributors, suppliers and generators in Great Britain concerned with the use of the electricity distribution system.

DCUSA comprises a number of sections. Section 2 covers the commercial arrangements between relevant parties. Sections 2A and 2B are most relevant, however reference to all sections is included here for completeness.

Section 2A - Distributor to Supplier/Generator Relationships
 Section 2B – Distributor to Distributor/(OTSO) Relationships
 Section 2C – Distributor to Gas Supplier Relationships
 Section 2D – Electricity Supplier to Gas Supplier Relationships
 Section 2E – Distributor to Third Party Electricity Supplier
 Section 2F – Electricity Supplier to Third Party Electricity Supplier Relationships

A modification is defined in DCUSA as

– any actual or proposed replacement, renovation, modification, alteration or construction:

(a) by or on behalf of the Company to the Company's Electrical Plant or Electric Lines (or the manner of their operation); or

(b) by or on behalf of the User (or, in the case of the OTSO Party, the Offshore Transmission Owner) to the User's (or that owner's) Electrical Plant or Electric Lines (or the manner of their operation)

which in either case has, or may have, a material effect on the user (or the User's System) or on the Company (or the Company's Distribution System) respectively.

Section 3 includes General Legal Provisions and contains a number of schedules.

The National Terms of Connection are included in Schedule 2B.

In here a

"Modification" means, in respect of a Party, any actual or proposed replacement, renovation, modification, alteration or construction by or on behalf of that Party to either that Party's Plant or Apparatus or the manner of its operation, which (in either case) has or will have a Material Effect on the other Party;

Clause 14 further says

14.1 No Modification may be made by or on behalf of either Party otherwise than in accordance with the provisions of this Clause 14.

14.2 Where the Customer wishes to make a Modification it shall complete and submit to the Company an Application for a Modification.

14.3 The Company shall make a Modification Offer to the Customer as soon as reasonably practicable and in accordance with the requirements of its Electricity Distribution Licence. The Parties shall discuss in good faith the implications of the proposed Modification(s).

Schedule 13 which covers Bi-Lateral Connection Agreements, also comprises a number of schedules. An Application for Modification is contained within Schedule 5.

In addition to both Primary and Secondary Legislation Engineering Recommendations (ERECs) also govern generation connections to electricity networks. EREC G99 also requires DNOs to be notified in advance of any proposed changes.

As the dynamics of electricity networks continues to change and those connected to it seek more active participation then it is likely that requests to make alterations/modifications to existing connections will become more prevalent.

Any modification to one connection (installation) has the potential to have a detrimental impact on any other connection (installation). Similarly, modifications made to one connection (installation) has the potential to have a detrimental impact on connection requests in the connection application queue.

Appendix 2: Glossary

The following terms are used throughout this document:

Bi-lateral Connection Agreement	An agreement between a distribution network company and the User
DER	Distributed Energy Resources
D-CODE	Distribution Code
DCUSA	Distribution and Connection Use of System Agreement
DNO	Distribution Network Operator
ENA	Energy Networks Association
ELS	Export Limiting Scheme
EREC	Engineering Recommendation
MEC	Maximum Export Capacity
MIC	Maximum Import Capacity
TIC	Total Installed Capacity