Northern Ireland Electricity Networks

CLUSTER METHODOLOGY REVIEW

Consultation Paper

28/07/2022

Contents

EXECUTIVE SUMMARY

This document follows on from the NIE Networks' Cluster Methodology Review Call for Evidence (CfE) which closed on the 13th November 2020. This CfE sought to gather evidence on aspects of the existing cluster methodology and future considerations, including the connection of large customer and network demand into clusters.

A total of 13 responses were received from industry to the CfE. NIE Networks welcomes the level of engagement received from all sections of industry and strongly encourages continued engagement throughout the process. This engagement has provided a helpful insight on stakeholder views on the topics raised in the CfE and has influenced the proposals presented within this consultation document.

The NIE Networks Statement of Charges[1] for Connection to the Northern Ireland Electricity Networks distribution system (the 'SoCC') sets out a methodology, in Appendix 2, for the connection of generation sites within a defined area to a cluster substation (the 'cluster methodology'). The cluster methodology has been a major success in facilitating the connection of renewable generation in Northern Ireland, and a major contributor towards the early achievement of the 2020 40% target. This target was in fact exceeded ahead of time, as 44% of electricity consumed for the 12-month period ending 30 June 2019 came from renewable sources[2].

The cluster methodology has provided significant capacity, technical and environmental benefits for the connection of renewable generation in Northern Ireland.

The Northern Ireland Energy Strategy – The Path to Net Zero Energy [3] outlines a range of recommendations and policies to achieve a 56% reduction in energy related emissions, including delivering at least 70% of electricity consumption from a diverse range of renewable resources. More recently, as per the Climate Change Act[4], the Department for the Economy must ensure that at least 80% of electricity consumption is from renewable sources by 2030. Therefore, it is appropriate that the cluster methodology is reviewed so that assets are utilised efficiently to facilitate the delivery of these targets. By carrying out this review of the cluster methodology, NIE Networks is acting to comply with the Electricity (NI) Order 1992[5], Article 12(1), 'It shall be the duty of an electricity distributor to develop and maintain an efficient, coordinated and economical system of electricity distribution'.

NIE Networks considers that, following the experience gained from connecting renewable generation to cluster infrastructure, further benefits could be derived in certain areas. Due to the direction of travel of the whole energy system, including the electrification of heat and transport, it is also prudent to consider future cluster matters such as connecting large customer and network demand into constructed cluster infrastructure.

1.1 General Views

In general, respondents were supportive of the proposals outlined in the CfE. This included the proposed changes to aspects of the existing cluster methodology such as capacity allocation, cluster designation and timing as well as the proposal on future cluster matters.

Question 11 of the CfE asked **"Do you agree that connecting network and large customer demand using constructed cluster infrastructure would be an efficient, coordinated and economical use of the network? If not, please state why."**

[1] https://www.nienetworks.co.uk/statementofcharges
[2] https://www.economy-ni.gov.uk/news/40-electricity-consumption-renewable-sources-by-2020-achieved-ahead-schedule
[3] https://www.economy-ni.gov.uk/sites/default/files/publications/economy/Energy-Strategy-for-Northern-Ireland-path-to-net-zero.pdf
[4] http://www.niassembly.gov.uk/globalassets/documents/legislation/bills/executive-bills/session-2017-2022/climate-change-no.-2-bill/climate-chnage-no.-2-bill-as-amended-at-fcs---full-print-version.pdf
[5] https://www.legislation.gov.uk/nisi/1992/231/contents

92% of respondents agreed that connecting network and large customer demand using constructed cluster infrastructure would be an efficient, coordinated and economical use of the network. 8% of respondents neither agreed nor disagreed. NIE Networks welcomes the support for connecting network and large customer demand using constructed cluster infrastructure and the general agreement that it provides benefits to generation customers, large demand customers and the overall NI customer base.

A number of important themes were prevalent in the responses to the consultation questions about connecting demand to clusters:

- A general principle of not negatively impacting connected renewable generation should be held when connecting demand.
- The need for engagement with the Transmission System Operator (TSO) on each individual case.
- The treatment of demand connections in relation to security of supply requirements.
- The treatment of electricity storage in relation to security of supply requirements.
- Further consideration of behind-the-meter connection of demand.

1.2 Proposed Approach

NIE Networks' response to the general views raised by the respondents is detailed below:

NIE Networks agrees with the request that a general principle of not negatively impacting connected renewable generation is held when connecting demand. The technical implications of connecting demand customers into clusters were considered in the CfE and will continue to be considered to ensure that the existing connections are not impacted. It is also agreed that the connection of demand should not impact upon the standard that generators are required to meet in terms of security[6] of supply. NIE Networks' minimum security of supply planning obligations are defined by Engineering Recommendation (EREC) P2 (NI) of the Distribution System Security and Planning Standards. According to EREC P2[7] a level of security is required for demand but not for generation and as a consequence there will be no impact upon the standard that generators are required to meet in terms of security of supply as a result of the connection of demand at clusters. NIE Networks will also ensure that the voltage at the 33 kV busbar will continue to be designed to 1.0pu at clusters. This will ensure that the amount of renewable generation that can be connected to a cluster substation remains maximized while facilitating the connection of large customer and network demand to the cluster.

NIE Networks agrees with the comment that engagement with SONI is required. As Cluster infrastructure contains transmission and distribution infrastructure, this engagement is important for an efficient implementation of the changes proposed in this consultation. NIE Networks recognises SONI's obligation to meet the Transmission System Security and Planning Standards (TSSPS)[8] for the connection of demand. Therefore, NIE Networks has engaged with SONI to discuss these proposals and moving forward existing mechanisms[9] will be utilised to ensure there is appropriate Transmission and Distribution co-ordination on both network reinforcement projects and large demand customer connections to existing clusters.

NIE Networks acknowledges the possibility of a customer accepting a reduced level of security; however, such a scenario would need to be considered on a case-by-case basis. NIE Networks is ensuring that this

[6] *System Security* - The capability of a system to maintain supply to a defined level of demand under defined outage conditions.
[7] https://www.nienetworks.co.uk/documents/d-code/distribution-system-security-and-planning-standard/ena_er_p2_issue_6_(2006)-ni.aspx
[8] https://www.soni.ltd.uk/media/Northern-Ireland-TSSPS-September-2015.pdf
[9] Transmission Interface Agreement (TIA) planning and connections panel

consultative process takes account of our statutory and licence requirements and therefore has focused on the requirements, rather than the derogation of these requirements.

NIE Networks acknowledges that electricity storage is a new technology and cannot be accurately categorised as purely demand or generation. However, electricity storage is capable of being both a demand customer and a generation customer and therefore it is necessary to consider both when designing their connection to the network.

In relation to the classification of an electricity storage units demand as being an 'interim demand' or a 'final demand', NIE Networks takes direction from the DSSPS, which includes EREC P2. Engineering Report (EREP) 130[10], which is a supplementary guide to the application of EREC P2 states in section 9.5 that 'The import from a Non-Contracted ES (Electricity Storage) should be assumed as being accounted in the normal demand profile, i.e. within the Measured Demand[11].' Therefore, the demand required by a storage unit is included in the overall Group Demand, and therefore a level of distribution security is required for connections where the MIC of the storage unit is over 1 MW. SONI is also required to secure demand groups of 1 MW or above, with the minimum planning supply capacity increasing as the demand group increases.

NIE Networks recognises the role that behind-the-meter demand will play at generation sites in future energy scenarios. For clarification, the connection of behind-the-meter demand and the subsequent increase to the site MIC will be subject to the same principles applicable to other demand connections at clusters (as detailed throughout this consultative process), including the requirement for the demand to be appropriately secured according to EREC P2.

1.3 How to Respond

NIE Networks invites interested parties to respond to this consultation. Responses should be sent electronically to Connor.Carville@nienetworks.co.uk, and copied to Carl.Hashim@nienetworks.co.uk, by 5pm on Friday 9th September 2022. The responses will be analysed by NIE Networks and will be used in the development of a decision paper which will be submitted to the Utility Regulator (UR) for approval.

[10] EREP 130 - https://www.ena-eng.org/ena-docs/Index?Action=ViewDetail&EID=99921&tab=dcode

[11] *Measured Demand* - summated demand measured at the normal (network) infeed points to the network for which Group Demand is being assessed

2. INTRODUCTION

This document follows on from the NIE Networks' Cluster Methodology Review Call for Evidence (CfE) which closed on the 13th November 2020. This CfE sought to gather evidence on aspects of the existing cluster methodology and future considerations, including the connection of large customer (33 kV connected demand customers) and network demand into clusters.

A total of 13 responses were received from industry and stakeholders to the CfE. NIE Networks welcomes the level of engagement received from all sections of industry and strongly encourages continued engagement throughout the process. This engagement has provided a helpful insight on stakeholder views on the topics raised in the CfE and has influenced the proposals presented within this consultation document.

This consultation document discusses 'Present Cluster Matters' in section 3, which outlines how further benefits could be derived in certain areas. The connection of demand into clusters is then discussed in section 4 – 'Future Cluster Matters'.

2.1 Cluster Background

The introduction of the Northern Ireland Renewables Obligation (NIRO) in April 2005 provided financial incentives for renewable generation. When this was coupled with the Northern Ireland Assembly's stated intention (in 2010) to achieve 40% of electricity consumption from renewables by 2020[12], it was clear that more sophisticated arrangements were required both technically and commercially to enable high volumes of renewable generation to connect within reasonable timelines and in a manner more sustainable for the environment.

The purpose of the cluster methodology was to improve access to the network for remote renewable generation, by extending the 110 kV transmission system, in the form of a 110/33 kV substation (referred to as a cluster substation), to a point more central to these groups of renewable generation projects. This enabled a more efficient connection arrangement with a reduced environmental impact by decreasing the aggregated length of overhead network required.

The cluster methodology was consulted on in detail, with endorsement from the Utility Regulator (UR), from March 2010 through May 2013, at which point the detailed cluster methodology and charging arrangements were introduced into the SoCC as Appendix 2 and section 7 respectively [13].

2.1.1 Approved Charging Methodology

As stated in section 7 of the SoCC each generation developer pays in proportion to their share of the connection generation capacity. Therefore, each developer would pay in full for its unique connection assets and would pay for a share of the joint assets, based on the fraction of the total connection capacity. In other words, if the connection capacity was, 90 MW, and the generator to connect had a capacity of 31 MW, then it would pay 31/90th of the cost of the cluster infrastructure.

Notably, using this mechanism it is possible that some of the costs of the shared assets would not be recovered from the developers as it would require the volume of generation connected to equal the connection capacity. This balance is recovered through use of system charges and is ultimately borne by Northern Ireland customers. To mitigate against the risk that the cluster is only minimally utilised, a

[12] https://www.economy-ni.gov.uk/sites/default/files/publications/deti/sef%202010.pdf
[13] https://www.nienetworks.co.uk/statementofcharges

threshold of 56 MW is used as the minimum combined weighted Maximum Export Capacity (MEC) needed to justify a cluster.

Where the capacity of the first transformer is fully utilised and a second transformer is installed then a different approach is applied. The first application to trigger the requirement for a second transformer would pay the full cost of the sole-use assets, and the full cost of the assets which may be shared at some point in the future e.g. the second transformer. Charging principles for all connections will be considered in a full connection charging review which will involve a full consultation process; however, it falls outside the scope of this consultation.

2.2 Benefits and Success of Clusters

The cluster methodology has been a major success in enabling the high levels of renewable generation connected to and committed to connect in Northern Ireland, and a major contributor towards the early achievement of the 2020 40% target. This target was in fact exceeded ahead of time, as 44% of electricity consumption for the 12-month period ending 30 June 2019 came from renewable sources[14]. It is probable that clusters will also play an important role in achieving 2030 NI Energy Strategy and Climate Change Act targets.

Six clusters were commissioned between 2012 and 2021, enabling approximately 590 MVA of renewables to be connected, meaning that cluster connections represent approximately a third of all renewables connected in NI.

Without the cluster methodology, it is unlikely that the 2020 target would have been met due to a number of logistical and technical constraints. Not only does the cluster methodology provide much more robust technical control, but it has also enabled efficient connections of 24 large scale[15] generation projects.

The cluster methodology has provided benefits in the following areas:

- Capacity – a greater volume of renewable generation has been able to connect to the network. It has created large volumes of generation capacity in areas of the country where it was previously limited.
- Technical – improved power flow, voltage management and communications control from a central point. It has provided more efficient control of generation onto the Distribution and Transmission systems.
- Environmental – the aggregated length of overhead lines has been greatly reduced by extending the 110 kV network, therefore shortening the 33 kV lines connecting the renewable generation to the network.
- Constraint Reduction – the creation of capacity at clusters has bypassed potential constraints at existing 110/33 kV Bulk Supply Points (BSPs).
- Advancing Infrastructure – The funding arrangement agreed with the UR has enabled work to commence in advance of applicant funding, therefore putting downward pressure on connection timescales.

[14] https://www.economy-ni.gov.uk/news/40-electricity-consumption-renewable-sources-by-2020-achieved-ahead-schedule

[15] NIE Networks defines large scale as greater than or equal to 5 MW

The creation of cluster substations has been very successful in facilitating large volumes of renewable generation and has been a major contributor to the whole system drive towards a low carbon future. It marked an innovative approach to anticipatory investment, whilst overcoming capacity, environmental and technical problems and the cluster methodology will continue to be utilised to deliver these benefits and meet future renewable generation targets.

2.3 Consultation Process and Timelines

It is envisaged that this document will be read in conjunction with the CfE. However, in order that this consultation document clearly presents all key points it will provide a summary of each topic outlined in the CfE along with the relevant response from stakeholders on the issue. All non-confidential responses to the CfE have been issued alongside this document. The timelines for this process can be seen in Figure 1 below.

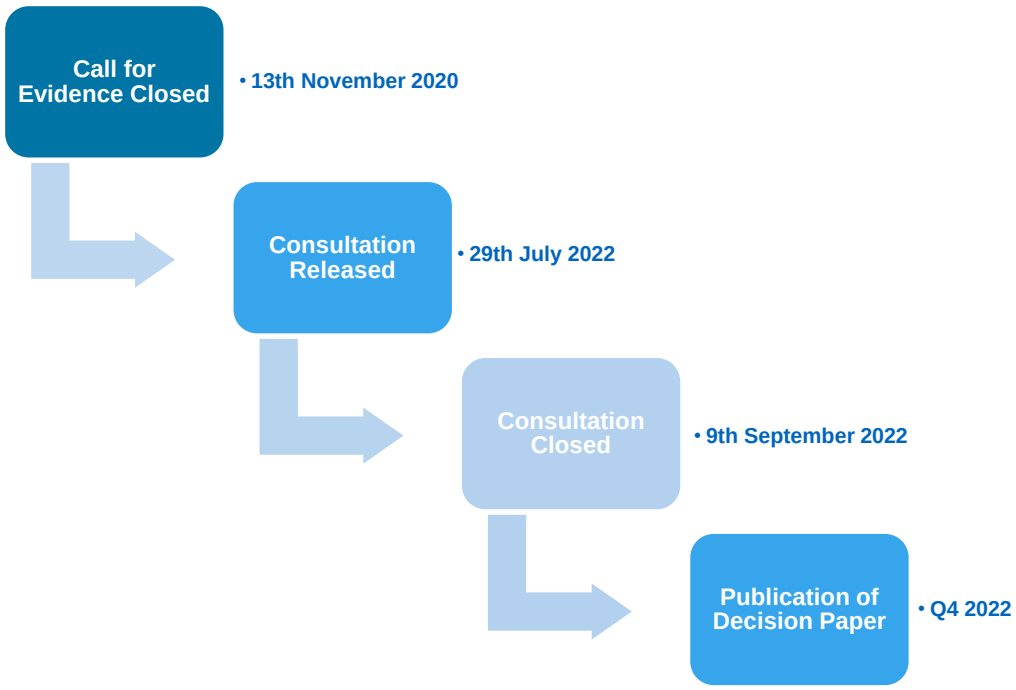


FIGURE 1 – CONSULTATION PROCESS AND TIMELINES

2.3.1 Why Change the Cluster Approach?

The cluster methodology has provided significant capacity, technical and environmental benefits for the connection of renewable generation in Northern Ireland. In the light of future targets, such as those included in the new Northern Ireland Energy Strategy – The Path to Net Zero Energy and the Climate Change Act, plus the existing commitment for the UK to bring all greenhouse gas emissions to net zero by 2050, it is appropriate that the cluster methodology is reviewed so that assets are utilised efficiently to facilitate the delivery of these targets. By carrying out this review of the cluster methodology, NIE Networks is acting to comply with the Electricity (NI) Order 1992, Article 12(1) which states that, “It shall be the duty of an electricity distributor to develop and maintain an efficient, coordinated and economical system of electricity distribution”.

NIE Networks considers that, following the experience gained from connecting renewable generation to cluster infrastructure, further benefits could be derived in certain areas. Due to the direction of travel of the whole energy system, including maximising the utilisation of existing assets and the electrification of heat

and transport, it is also prudent to consider future cluster matters such as connecting large customer and network demand into constructed cluster infrastructure.

NIE Networks sought evidence from stakeholders regarding the proposed changes to the cluster methodology in the CfE, including the facilitation of demand connections into clusters. The current cluster methodology has been successful in helping to facilitate large volumes of renewable generation to the network and assist in Northern Ireland achieving ambitious clean energy targets. The success of this was in part due to the successful engagement between NIE Networks and its stakeholders to create a robust and suitable cluster methodology.

NIE Networks welcomes the broad support on the proposals outlined in the CfE and believes that this support consolidates the need for this review of the cluster methodology. Responses from stakeholders to the CfE have helped with the development of this consultation document which outlines how NIE Networks plans to overcome the issues raised to ensure the efficient utilisation of assets by updating the cluster methodology.

Responses to this consultation will be used by NIE Networks to produce a decision paper which will be submitted to the UR for approval.

3. PRESENT CLUSTER MATTERS

3.1 Standardisation of Capacity Allocation

3.1.1 Call for Evidence Proposal

The current NIE Networks' charging arrangements for Authorised Generators connecting to the network as part of a cluster makes some explicit assumptions about the use of MW and MVA, and in other places uses the terms interchangeably.

NIE Networks' SoCC states the proportion of the cost of the cluster infrastructure that will be charged to each Authorised Generator connecting to the first transformer will be assessed on the basis of the MVA of capacity installed, or to be installed. The example that follows calculates this proportion of cost based on MW installed or to be installed, omitting the reactive power element of the connection.

The NIE Networks' Distribution Code requires all Type C Power Generating Facility(s)[16] to be capable of operating at its Registered Capacity in a stable manner as a minimum within the power factor range 0.95 absorbing to 0.95 producing. This would mean a generator with a 10 MW Registered Capacity must (as a minimum) be capable of providing ±3.3 MVAr equating to an MVA capacity installed or to be installed of 10.5 MVA. NIE Networks proposes updating the Statement of Connection Charges to reflect that MVA will be calculated based on a 0.95 power factor, and update the charging examples to align with this.

3.1.2 Call for Evidence Responses

The CfE asked in Question 1, "**Do you agree that the MVA capacity installed or to be installed should be calculated based on a 0.95 power factor requirement as per the NIE Networks Distribution Code?"**

Responses received to the call for evidence indicated that industry acknowledge and accept the technical limitations of a 90 MVA transformer and broadly agree with the proposal to calculate the MVA capacity installed or to be installed taking account of the reactive power requirements of the generators.

One respondent suggested that the calculation should be based on the Grid Code requirements for these generators rather than a specific requirement within the SoCC.

The concept of allowing an overload capability on the 110/33kV transformers at cluster sites was raised in two responses. One respondent provided international examples of distribution network operators allowing generation capacity higher than the name plate rating of the transformer to be installed and a standard allowing a 10% overload on transformers installed for the connection of wind generation.

The CfE also asked in Question 2, "**In order to accurately reflect the technical aspects discussed above, do you agree the NIE Networks' SoCC text and examples should reflect the statement in 7.8 of the SOCC; the proportion of the cost of the cluster infrastructure that will be charged to each authorised generator connecting to the first transformer will be assessed on the basis of the MVA of capacity installed, or to be installed? If not, please explain why."**

All responses to this question agreed that the proportion of costs chargeable to an authorised generator should be based on the MVA capacity of the generator.

One respondent acknowledged that this is the most cost reflective method of calculation and minimises the capacity of the cluster infrastructure financed by the general NI customer base.

[16] Type C Power Generating Facility(s) means Power Generating Facility(s) with a Registered Capacity of 5 MW and above.

Two respondents noted the linkage between the concept of allowing an overload capability on the transformers and the potential for this to increase the denominator from the current 90 MVA.

3.1.3 Proposed Approach

NIE Networks welcomes the agreement of the respondents to this question and will update the SoCC text and examples within the SoCC to reflect the reactive power element of the generator MVA rating.

The SoCC wording will include reference to the Distribution Code requirements for reactive power when determining the MVA capacity of a generator as opposed to a specific power factor reference in the SoCC.

For example, the current EREC G99/NI minimum reactive power requirement for Type B Generating Units is 0.95 leading (absorbing) to 0.98 lagging (generating). When calculating the MVA capacity required for the connection of a Type B Generating Unit the calculation would be based on the 0.95 requirement i.e. the highest MVAr requirement. Therefore, a 5 MW Type B Generating Unit would require a capacity of 5.3 MVA. A Type B Generator is a Power Generating Module with a Connection Point below 110 kV and Registered Capacity of 100 kW or greater but less than 5 MW.

If the generator wants to provide reactive power in a range in excess of what is required within the Distribution Code, they can inform NIE Networks of this through the application process. NIE Networks will then base all network design studies and costing on the capacity requested.

The generation capacity ratings currently applied to our transformers have no correlation to ambient temperature i.e. we do not increase the ratings of transformers during winter when it is colder or decrease in summer when it is warmer. When siting a transformer, we do not consider wind cooling or shelter and therefore it is not possible to conclude that when the output of the windfarms connected to a cluster is high, the associated cluster transformer(s) are being cooled by the wind.

NIE Networks will continue to determine the transformer generation capacity based on the manufacturer nameplate rating.

It is worth noting that NIE Networks are currently progressing a Smart Asset Monitoring (SAM) [17] innovation project which aims to determine the thermal capacity of distribution network assets during different weather conditions. This project will implement enhanced thermal modelling of primary (33/11 kV) transformers using historic data including winding temperature indicators (WTIs), with the view of identifying the forward and reverse power flow ratings at different weather conditions. This project will provide key learnings and recommendations for the thermal rating of primary transformers.

3.2 Cluster Designation

3.2.1 Call for Evidence Proposal

The existing NIE Networks' cluster methodology was approved by the Utility Regulator in 2013 when planning matters in Northern Ireland were managed by the NI Planning Service. However, since then the responsibility for planning has been decentralised and is now a matter for local councils. The previously centralised process for renewable planning applications allowed for close coordination between the NI Planning Service and NIE Networks, which allowed us to better plan and coordinate the development of the electricity network based on the single strategic view of renewable projects in progress. Since planning powers have been devolved to local councils, this central strategic view no longer exists, leading to a risk of a more ad-hoc and less strategic approach to renewable projects and associated infrastructure.

[17] https://www.nienetworks.co.uk/future-networks/level2/our-innovation-projects/sam

It also leads to differences across councils regarding the approval of planning permission for renewable generation projects.

The probabilistic approach used by NIE Networks to anticipate the amount of generation in an area and to determine if it meets the threshold to designate a cluster assumes a consistent approach to planning matters across Northern Ireland. Weighting factors are applied to the generator MEC based on which stage of the planning process it is in: Early Stage, EIA Commenced, Submitted to Planning Service or PAC, Withdrawn from Planning and Consented.

At present a threshold of 56 MVA is used as the minimum combined weighted MEC needed to justify a cluster. This is based on the typical capacity of 33 kV overhead lines (28 MVA) and the need to reduce aggregated overhead line lengths. Currently this MVA value is calculated based on an assumed unity power factor i.e. 1 MW = 1 MVA. Based on the technical reasons discussed in section 2.1 NIE Networks believe the MVA value should be calculated based on a 0.95 power factor

3.2.2 Call for Evidence Responses

The CfE asked in Question 3, "**Do you believe the current approach for cluster designation remains fit for purpose i.e. weighted capacity calculation based on planning permission status or do you believe an alternative approach should be considered? Please provide reasons behind your opinion and propose alternatives if appropriate."**

One respondent reinforced their support for planning permission being linked as a requirement in the connection offer process as it is a good indicator that the customer is committed to a new connection. Therefore, they continue to support the designation of clusters based on projects with planning and in the planning process. They suggested that if NIE Networks had information on developers who are conducting Environmental Impact Assessments this would also be a good early indicator as to where new generation is likely to be located.

Another respondent acknowledged how successful the current methodology has been in the connection of renewable generation and in turn its contribution to meeting the 2020 renewable targets. They suggested the scope of designation could be expanded to include other potential customers that could accept a connection at the cluster design standard such as storage and other potential demand types.

A third respondent appreciated that the correct balance needs to be struck between preventing speculative applications for connection and ensuring that the process of obtaining a connection into a cluster is not unduly onerous, either financially or administratively. They suggested that the weighting factor for a generator who has applied for a grid connection could be reviewed. This is on the basis that planning permission is not a pre-requisite to obtaining a connection offer from NIE Networks, however the planning milestone requires planning permission to be obtained no later than 120 days from the date of the terms letter. Based on existing weighting factors a number in the range of 0.1-0.8 was suggested.

The CfE asked in Question 4, "**Do you agree cluster designation should be based on 56 MVA assuming a 0.95 power factor? If not, please explain why."**

All responses agreed that cluster designation should continue to be set at 56 MVA, based on the linkages to the capacity of two 33kV overhead line.

Responses also acknowledged the need to consider the reactive power element of the MVA capacity and were in support of this change.

One respondent suggested the power factor used in the calculation should reflect the Grid Code requirements for that type of connection.

3.2.3 Proposed Approach

NIE Networks welcomes the support of the industry regarding the usage of planning permission as an indication of commitment to the generation project and a connection. On this basis NIE Networks proposes to maintain the application of weighting factors when determining the anticipated extent of generation when going through the cluster designation process.

In March 2021 the Department for Infrastructure published figures collated by the Northern Ireland Statistics and Research Agency that showed the approval rate for renewable energy planning applications was 79.2% in Q3 2020/21[18]. The detailed analysis of the high level numbers quoted in the report show that 88% of the applications in this period were for single turbines (23 of 26 applications). When considering the windfarm data specifically, the success rate from April - June 2020 was 100%, October – December 2020 was 50% and YTD was 66.7%. Therefore, due to the variability of the windfarm specific data (based on the low number of windfarm applications in this period), and the relative consistency with the approval of renewable energy projects as a whole, NIE Networks proposes to maintain the 0.8 weighting factor for generators who have made a submission for planning or submitted an appeal to the PAC.

NIE Networks agrees that knowledge of developers undertaking environmental impact assessments would be a good early indicator, however we do not propose changing the weighting factor applied to this group of generators. It is proposed that the current weighting factor of 0 will remain unchanged.

NIE Networks has reviewed the weighting factors applied when calculating the weighted anticipated cluster capacity, which is based on what stage in the planning process the generator is at. To remove any potential for confusion NIE Networks is proposing removing the category currently titled “Applied for Grid Connection” that had a weighting factor of 0.8. This is because a generator that has applied for a grid connection will either be consented and have a weighting factor of 1 applied, or have submitted to planning or appealed to the Planning Appeals Commission (PAC) and will have a weighting factor of 0.8 applied. However, this assumption is based on the fact that a generator will be able to meet the milestone for production of planning permission as set out in the Distribution Generation Application and Offer Process Statement[19](i.e. 120 days from the date of the issue of the offer of terms for connection). Accordingly, the planning milestone is to be incorporated in Appendix 2 of the SOCC.

NIE Networks has considered the suggestion that the scope of designation could be expanded to include other potential customers that could accept a connection at this design standard such as storage and other potential demand types. The cluster methodology was introduced in Northern Ireland to facilitate the connection of additional renewable generation and the basis for cluster substations has not changed. The opening of constructed clusters for demand connections is principally to better utilise existing infrastructure, rather than allowing demand connections to influence the location and approval of emerging infrastructure. There is also the consideration of planning standards applicable to demand connections and the initial construction of a cluster being with a single 110/33 kV transformer and 110kV line. Therefore, NIE Networks are not proposing to expand the scope of designation beyond the renewable generation it currently applies to.

NIE Networks welcomes agreement on maintaining the 56 MVA weighted capacity threshold for cluster designation and the agreement to include reactive power requirements within the calculation of the weighted capacity. NIE Networks agrees that specific power factor requirements should not be included in the SoCC and therefore will refer to the reactive power requirements in the Distribution Code.

[18] https://www.infrastructure-ni.gov.uk/system/files/publications/infrastructure/planning-statistics-q3-2020-21-bulletin.pdf

[19] https://www.nienetworks.co.uk/documents/distribution-generation-application-and-offer-proc.aspx

3.3 Timing

3.3.1 Call for Evidence Proposal

The NIE Networks' Statement of Connection Charges acknowledges that a connection offered to a generator via a designated cluster may take longer to deliver than an individual 33 kV connection to an existing constructed main substation. This can be due to a number of factors, including the need to obtain legal and regulatory consents for the cluster substation. The time required to complete substation design, line surveys, legalities and procurement of the equipment can be considerably longer for a clustered arrangement than with a direct connection to an existing node.

Accordingly, the Timing section of Appendix 2 of the Statement of Connection Charges makes provision for a single generator to be offered a direct connection to an existing node where that generator may be delayed by the implementation of a cluster approach compared with the timing for an individual 33 kV connection to an existing node. An applicant who would otherwise be offered a connection via a cluster must currently meet three conditions before they can be considered for a direct connection to an existing node. These are:

a) The applicant is the "first in the queue" for connection to that particular cluster, measured by the date of application,

b) A connection via a cluster would result in severe delay – defined as 18 months or more – in comparison with a direction connection, and

c) Providing a direct connection to that applicant would not result in the cluster falling below the 56 MW threshold for designation.

The Timing provision within the cluster methodology was developed prior to NIE Networks having experience of the cluster process from designation to construction and energisation. Six clusters were commissioned between 2012 and 2021, enabling approximately 590 MVA of renewables to be connected, meaning that cluster connections represent approximately a third of all renewables connected in NI. This practical experience has shown that the time taken from pre-construction to completion of a cluster can range between 4 years and 8 years.

NIE Networks' experience is that the Timing provision in its current form does not reflect the length of time required to develop and construct a cluster and is unclear as to the point in time at which each of the three conditions must be assessed. Arguably an ongoing assessment of connection options for the first in the queue is required each time there is a change in the connection queue. This continual process results in the potential for multiple changes to connection offers and connection costs prior to applicants being connected and opens a loop of continual analysis for NIE Networks which can be time consuming but ultimately nugatory if connection to a cluster is preferred by the first in the queue. This can result in a lack of certainty for NIE Networks and generators. Where the Timing provision is applied this can then have a knock on effect on other applicants in the connection queue.

Based on this practical experience, and in order to maintain a Timing provision that can be implemented with certainty, in the CfE NIE Networks proposed amending the Statement of Connection Charges so that the Timing provision could only be applied if the following conditions were met:

a) The applicant is the "first in the queue" for connection to a designated or approved cluster and has suffered or will suffer a Delay in being connected to that cluster. In this context 'Delay' shall mean that connection shall not occur within a period of 24 months commencing on the estimated date of connection stated in the connection offer issued to the applicant by NIE Networks.

b) The first in the queue has applied for and paid NIE Networks for a feasibility study to be undertaken within 3 months to determine if a direct connection to an existing node is technically acceptable; and

c) Where a direct connection to an existing node is technically acceptable, offering a direct connection to an existing node to the first in the queue would not result in the cluster falling below the 56 MVA threshold for designation should the offer for the direct connection to an existing node be accepted.

3.3.2 Call for Evidence Responses

In the CfE, Question 5 asked, "**Do you agree that the Timing provision currently provided for does not reflect cluster experience and cannot be applied with certainty for both NIE Networks and generators? If not, please explain why."**

All responses received agreed that a timing provision should be included within the cluster methodology. Respondents noted that to date the timing provision has been poorly understood by industry and has not been meaningfully considered for existing clusters as a dedicated connection was not viable in many cases, even for the first project.

Another response highlighted their support for the cluster methodology, considering it the best approach for the strategic connection of significant quantities of renewables within a particular geographic area. The response noted that consideration should be given to the environmental impacts and the impact on cluster designation when considering a direct connection for the first in the queue. The response agreed that the timelines for the establishment of cluster infrastructure can be significant.

In the CfE, Question 6 asked, "**Do you agree with the proposal for amending the SoCC? If not, please explain why."**

One response agreed with the proposed timing provision except with the proposal to extend from 18 to 24 months and requested justification for the change. Clarity on the application for a feasibility study was also requested.

Another response agreed there is a need to establish a more realistic timing provision to reflect the experiences gained in establishing existing cluster infrastructure. It also noted the need to make the process more efficient by reducing the risk of having to continually reassess the connection arrangements each time the connection queue changes.

In the CfE, Question 7 asked, **"Do you have any other comments or suggestions with regard to the future use of the Timing provision?"**

A respondent noted that it is important to have a timing provision as there can be substantial delays to the first project in a new cluster area when new cluster infrastructure has to be developed and constructed.

Another response suggested that the timing provision should be reviewed on a regular basis as further experience is gained. It may also be the case that the timing difference between a direct connection and a cluster connection will vary on a case by case basis and it may be prudent to consider a more dynamic timing provision rather than a set time period applicable to all.

3.3.3 Proposed Approach

NIE Networks welcomes the support for a suitable timing provision and for the cluster methodology as a whole. It is apparent that there is a general lack of understanding of the current timing provision and experience to date has shown it is not fit for purpose.

The concept of a dynamic timing provision was considered but it was not possible to implement in a consistent and fair manner. However, the proposed timing provision now determines a delay based on the difference between the estimated scheduled completion date stated in the offer of terms for connection issued to the applicant by NIE Networks and the latest scheduled completion date. Some consideration will be given to the source of the "Delay". Where the latest scheduled completion date has been delayed due to a connecting party change or delay e.g. change of route or connection methodology for the unique connection, this will not be considered when determining the "Delay". However, if the delay in the latest scheduled completion date is attributable to NIE Networks, this delay will be considered when determining the "Delay".

Previously the timing provision determined a delay based on the difference between a direct connection and a cluster connection. This change removes the uncertainties around the estimated timelines for a direct connection and the associated complexities and ensures all generators are treated consistently and increases the transparency of the process.

Therefore the 18-month comparison in the current timing provision is not comparable with the 24-month timeline in the proposed timing provision. The proposed timing provision is designed to protect the first in the queue from a latest estimated scheduled completion date that is delayed by more than 24 months from the estimated scheduled completion date of connection stated in the offer of terms for connection. This is balanced against the potential for the removal of the first in the queue to result in the cluster falling below the 56 MVA threshold for designation.

As discussed in the CfE, and acknowledged by the responses, the timing provision in its current form does not reflect the length of time required to develop and construct a cluster and is unclear as to the point in time at which each of the three conditions must be assessed. Arguably an ongoing assessment of connection options for the first in the queue is required each time there is a change in the connection queue. This continual process results in the potential for multiple changes to connection offers and connection costs prior to applicants being connected and opens a loop of continual analysis for NIE Networks which can be time consuming but ultimately nugatory if connection to a cluster is preferred by the first in the queue. This can result in a lack of certainty for NIE Networks and generators. Where the timing provision is applied this can then have a knock on effect on other applicants in the connection queue.

Therefore, NIE Networks is proposing that the first in the queue is required to indicate to NIE Networks that they wish to pursue a direct connection to trigger the timing provision (assuming other criteria are also met). This proposal is to provide certainty to the other generators in the cluster queue and to NIE Networks when applying the timing provision. Following submission of a connection design and analysis study application with the associated fee, NIE Networks will have determined if a direct connection to an existing node is technically acceptable no later than three months from the connection design and analysis study application date.

Based on practical experience, and in order to maintain a Timing provision that can be implemented with certainty, NIE Networks proposes to amend the Statement of Connection Charges so that the Timing provision could only be applied if all of the following conditions were met:

a) The applicant is the "first in the queue" for connection to a designated or approved cluster and has suffered or will suffer a 'Delay' in being connected to that cluster. In this context 'Delay' shall mean a delay in excess of 24 months, commencing on the estimated scheduled completion date stated in the offer of terms for connection issued to the applicant by NIE Networks, which is wholly attributable to NIE Networks.

b) The first in the queue has applied for and paid NIE Networks for a connection design and analysis study to be undertaken within 3 months of the connection design and analysis study application date, to determine if a direct connection to an existing node is technically acceptable; and

c) Where a direct connection to an existing node is technically acceptable, offering a direct connection to an existing node to the first in the queue would not result in the cluster falling below the 56 MVA threshold for designation should the offer for the direct connection to an existing node be accepted.

3.4 Technical Assessment – Geographic Extent of a Cluster

3.4.1 Call for Evidence Proposal

When determining the amount of generation capacity that is likely to connect to a potential cluster substation NIE Networks carries out an assessment of all generation anticipated in an area. The current cluster methodology limits this area to approximately 310 km^2 based on a 10 km radius from the potential cluster substation location. This radius was originally based on a 12 km maximum length of 33 kV 200 mm^2 aluminium overhead line that, when fully loaded, maintains the 33 kV voltage at the generator within statutory limits. The radius is reduced to 10 km to allow for the route length being generally around 20% greater than the direct distance from the source to the generator.

The current cluster methodology also allows for this radius to be extended when it is technically acceptable to do so. The radius is based upon average conditions so engineering principles and judgement are to be applied to refine any particular case. For example, it might be possible to use a 15 km 33 kV overhead line to connect a generator where the voltage rise at the generator remains within the upper statutory limit.

Developments in NIE Networks' connection policy including development of long cable connections and design means this 10 km limit can be extended in many scenarios, whilst maintaining the 33 kV voltage at the generator within statutory limits, based on factors such as generator size, technical specification and connection method i.e. overhead line or underground cable.

The inclusion of a radius is to act as a guide for NIE Networks when carrying out technical assessments to designate a cluster and for generators to understand the likely geographical extent of the cluster area.

3.4.2 Call for Evidence Responses

In the CfE, Question 8 asked, "**Do you agree with the benefits of including a radius but also allowing for engineering judgement to be applied ensuring optimised connection methods are offered?"**

One response agreed that applying just a strict 10km radius is not appropriate. Experience from existing clusters have shown that some projects are connecting with combinations of overhead line and underground cable of over 15 km in length. The response supported the use of engineering judgement when considering what projects could be included in a cluster. The respondent stated that developers should be able to engage with NIE Networks to understand if their project is being considered within a cluster.

Another response agreed with the inclusion of a radius to act as a guide for NIE Networks when carrying out technical assessments to designate a cluster. However, it is important that the radius remains as a guide and that the inclusion of a set radius does not preclude assessing more distant connections on the basis of their technical merits. The response stated that the use of engineering judgement and the use of new technologies and/or dynamic line rating should be capable of increasing the number of projects that could be accommodated into a particular cluster. The response agreed that providing a set radius provides a level of certainty over the range at which sites can expect to have access to a cluster.

In the CfE, Question 9 asked, "**Do you think the 10 km radius should be updated taking account of improvements in NIE Networks' connection policy and design? If yes, please provide suggestions."**

One respondent agreed that the radius is only really a guide and based on previous experience it is probably reasonable to increase the distance to 15 km. It was suggested that the new distance is determined from a review of the distance of windfarms to existing clusters as an impartial and accurate approach to determining an appropriate distance.

Another response agreed that the radius should consider latest technologies and best practice across the industry as well as being in line with NIE Networks' approved connection and design policies.

A third response suggested that some increase on the 10 km radius may be beneficial for increasing access to clusters. It was suggested that a 12 km radius would be appropriate as it is consistent with the length of line that when fully loaded, maintains the 33 kV voltage at the generator within statutory limits.

3.4.3 Proposed Approach

NIE Networks agrees with the feedback from industry that the inclusion of a radius is helpful but should not be interpreted as a strict limit, and therefore proposes to maintain the allowance for engineering judgement to be applied.

Based on the feedback of the responses NIE Networks carried out an assessment of the length of the 33 kV connections into existing cluster substations. This assessment agreed with the wider view of industry, in that almost all connections were made using a combination of overhead line and underground cable or were exclusively underground cable. On this basis, including a radius based on the assumption that all connections will be solely overhead line could be preventing the optimal development of clusters.

The analysis also showed that many 33 kV connections into cluster exceeded the 10 km radius due to a range of technical factors. On this basis NIE Networks proposes increasing the radius within the SoCC to 15 km, whilst maintaining the allowance for engineering judgement to be applied.

As mentioned, some previous applicants have been connected to a cluster even though they were outside the 10km radius guideline. Engineering principles and judgement have been applied to any applicants who have previously applied under the existing SoCC Appendix 2 guideline of a 10km radius.

If this consultation proposal is successful the SoCC will be updated to reflect the new 15km radius guideline. This new radius guideline would strictly only apply to connection applications received after the SoCC has been updated and approved by the Utility Regulator.

Consultation Question 1 – "Do you agree with the proposed approach outlined in section 3.4 – 'Technical Assessment – Geographic Extent of a Cluster'? If not, please provide rationale"

3.5 Definitions

3.5.1 Call for Evidence Proposal

NIE Networks recognises that there may be a requirement to include new definitions and/or update existing definitions within the SoCC as part of this proposed cluster methodology update. The need for these new and/or modified definitions will be dependent on the scale of the overall update, as proposed within this document. Therefore, it is not possible to propose any specific changes at this time.

3.5.2 Call for Evidence Responses

In the CfE, Question 10 asked, **"Do you agree that new and/or updated definitions may be required? If you have any specific concerns about new or existing definitions please provide information here."**

All responses acknowledged that changes to the Statement of Connection Charges may result in the need for some new/amended definitions. One response suggested that any updated definitions should, where possible, align with existing definitions in other approved documents. Another response requested that industry have foresight of any proposed changes to the SoCC as even minor changes can have wide reaching impacts.

3.5.3 Proposed Approach

A new definition of 'Large Demand Customer' is being proposed through this process, and changes to existing cluster definitions that refer solely to generators have been proposed. The definitions will be updated by NIE Networks in the SoCC, further details of which are given in section 5.

3.6 Present Cluster Matters Consultation Question

Consultation Question 2 – "Do you agree with the proposed approach to standardisation of capacity allocation, cluster designation, timing and definitions as outlined in the call for evidence and in sections 3.1, 3.2, 3.3 and 3.5? If not please provide rationale.

4. FUTURE CLUSTER MATTERS

The present cluster methodology was intended to facilitate solely the connection of renewable generation into cluster sites. NIE Networks now considers that network reinforcement costs to meet increases in demand, in particular associated with facilitating the future electrification of heat and transport to meet carbon reduction targets in more rural communities, can be minimised by utilising the existing cluster infrastructure.

This section of the CfE outlined the reasons, benefits and considerations associated with connecting demand into cluster substations. The key issues raised by the respondents to the questions asked have been presented and addressed in the following sections.

4.1 Drivers and Benefits of Change

Many of the justifications for connecting generation into a cluster are also applicable for the connection of demand. This approach can reduce overhead line lengths and hence minimises environmental impact, and a cluster connection may be the most cost effective solution to resolving network constraints in terms of the contribution required from the NI customer. It could be considered environmentally and commercially unsustainable to maintain a policy that requires the planning of 33 kV reinforcement infrastructure to by-pass a local cluster substation and connect to a more remote traditional 110 kV substation. In this situation, by making use of an existing technically feasible asset it is probable that the delivery time of any network reinforcement or large demand customer connection projects will be reduced.

Northern Ireland is expected to see considerable growth in demand due to the electrification of heat and transport. It is expected that this increase in load will utilise existing demand capacity at all voltage levels, leading to network congestion as the volume of these new Low Carbon Technologies (LCTs) increases. Whilst the connection of LCTs are currently modest, it is expected that over the next decade there will be a large increase in the number connecting, as demonstrated by government announcements, for example the UK wide 2030 ban on the sale of new Internal Combustion Engine (ICE) vehicles. NIE Networks is preparing for this increase by modelling the projected uptake of LCTs in order to better understand the scale of the impact they will have on the network and to plan for the subsequent investment which will be required.

In order to reduce the amount of conventional reinforcement (new lines, cables and transformers) required and ultimately minimise customer bills, NIE Networks are seeking to implement smart and market-based solutions[20] to unlock further capacity on the network. With this context in mind, it is important that NIE Networks continues to consider how all network assets can be used as efficiently as possible to deliver customer and network benefits. This therefore drives a need for NIE Networks to investigate the potential for using constructed cluster infrastructure for the connection of demand. It is worth noting that at other 110/33 kV substations (BSPs) the connection of both demand and generation is normal practice.

Electricity (NI) Order 1992, Article 12(1) states that" It shall be the duty of an electricity distributor to develop and maintain an efficient, coordinated and economical system of electricity distribution". Therefore, it is an obligation on NIE Networks that existing assets are used in the most efficient and economical way.

The connection of demand into clusters could provide a number of benefits to generators, demand customers and the wider NI customer base. These were outlined in the CfE.

[20] https://www.nienetworks.co.uk/future-networks/level2/our-innovation-projects

4.1.1 Call for Evidence Responses

In the CfE, question 11 asked **"Do you agree that connecting network and large customer demand using constructed cluster infrastructure would be an efficient, coordinated and economical use of the network? If not, please state why."**

92% of respondents agreed that connecting network and large customer demand using constructed cluster infrastructure would be an efficient, coordinated and economical use of the network. 8% of respondents neither agreed nor disagreed.

A group of respondents supported the connection of network and demand customers into clusters as long as it does not negatively impact the capacity of renewable generation that can connect to the cluster. These respondents acknowledged that NIE Networks has considered the technical implications of connecting demand customers into clusters in the CfE. They requested that this general principle of not negatively impacting the connection of renewable connections is maintained during the detailed design phase of these connections. These respondents also reinforced that connecting network and demand customers into clusters should increase cluster transformer capacity and reduce DLAF losses for generators.

Another respondent agreed that connecting network and large customer demand to clusters would be an economical use of the network. This respondent also raised the point that the connection of demand should not impact upon the standard that generators are required to meet in terms of security of supply as to do so would increase the cost of renewable deployment which would ultimately be felt by the end customer. They also stated that it is important that generators continue to remain capable of providing the same grid services, such as steady state reactive power under DS3 System Service arrangements. Another respondent commented that this approach will help facilitate emerging technologies such as electric storage, electric heating and electric vehicles seek connection to the distribution network, ultimately helping to achieve the net zero carbon target by 2050.

A respondent raised concern that the connection of demand into clusters should only be considered on a case-by-case basis. They highlighted the requirements in the Transmission System Security and Planning Standards (TSSPS) for the connection of demand, and that it would be uneconomic to develop a second 110 kV circuit unless the level of demand was of sufficient scale, and therefore contrary to the obligation placed on SONI to develop the networks in an efficient, economic and coordinated manner. The respondent also stated that they would be concerned that this approach might create an expectation that SONI would reinforce the 110 kV system and socialise these costs, thus causing a breach of its own obligations.

In the CfE, question 12 asked "**Do you agree that the SoCC should be updated to reflect that connecting network and large customer demand using constructed cluster infrastructure would be an efficient, coordinated and economical use of the network? If not, please state why."**

In general, respondents agreed that the SoCC should be updated to facilitate NIE Networks being able to connect large customer demand and network infrastructure to existing cluster infrastructure in an efficient, coordinated and economical manner, where the connection is determined to be the least cost technically acceptable solution.

One respondent commented that the connection of large customer and network demand should only be considered when where there are already two 110 kV circuits connecting the cluster substation, or where the demand customer accepts the lower standard of security of supply associated with the cluster design standard. This is to ensure that these costs are not socialised to the NI consumer, and the NI charging statement should ensure that this is the case. They also commented that SONI should be consulted on each individual case.

In the CfE, question 13 asked "**Do you agree that the connection of demand into clusters would provide benefits to generation customers, large demand customers and the overall NI customer base? If not, please provide reasons why"**

Generally, respondents agreed with the benefits which were explained in the CfE. Multiple respondents commented that the connection of aggregated flexible demand would have the ability to complement the existing generation and have positive effects on network constraints and curtailment. It was also highlighted that the addition of demand which is electrically close to generation will reduce network losses and that this approach would help reduce costs, contribute to decarbonisation targets and increase the efficiency of the system.

One respondent did not agree that these benefits will accrue to the overall NI customer base and commented that the connection of demand into cluster substations may not automatically equate to increased capacity to allow increased generation to connect to the cluster, such as for demand connections which may also include embedded generation or zero transfer schemes.

4.1.2 Proposed Approach

NIE Networks welcomes the broad support for connecting network and large customer demand using existing cluster infrastructure and the general agreement that it provides benefits to generation customers, large demand customers and the overall NI customer base.

Impact on Existing Connections

NIE Networks agrees with the request that a general principle of not negatively impacting upon connected renewable generation is held when connecting demand. The technical implications of connecting demand customers into clusters were considered in the CfE and will continue to be considered to ensure that the existing connections are not impacted. It is also agreed that the connection of demand should not impact upon the standard that generators are required to meet in terms of security of supply. NIE Networks' minimum security of supply planning obligations are defined by Engineering Recommendation (EREC) P2 (NI) of the Distribution System Security and Planning Standards. According to EREC P2 (considered further in section 4.2.) a level of distribution security is required for demand but not for generation and as a consequence there will be no impact upon the standard that generators are required to meet in terms of security of supply as a result of the connection of demand at clusters.

NIE Networks acknowledges the importance of the provision of grid services, such as steady state reactive power under DS3 System Service arrangements, and that generators at clusters often seek to provide these services. This is one of the benefits of the 33 kV busbar voltage concession introduced at clusters (discussed more in section 3.6) and as previously stated, it is NIE Networks intention that provision of these services is still achievable for cluster connections. It is worth noting that in order to help provide system wide voltage support and facilitate the participation of distribution connected generators in the DS3 market, NIE Networks is running a Nodal Controller Project[21]. The Nodal Controller is a means by which distribution connected generation can provide reactive power support to the TSO, whilst at the same time, ensuring that all relevant distribution parameters are kept within secure limits.

Benefits to the NI Customer Base

One respondent commented that the connection of large customer and network demand should only be considered where there are already two 110 kV circuits connecting the cluster substation, or where the demand customer accepts the lower standard of security of supply associated with the cluster design standard. The respondent raised concerns that to do otherwise would lead to inefficient socialisation of

[21] https://www.nienetworks.co.uk/future-networks/level2/our-innovation-projects/nodal-controller

these costs to the NI consumer and the benefits of the connection of demand into clusters would therefore not accrue to the NI customer base. However, NIE Networks has considered this in the following ways:

- For large demand customers, the facilitation of demand connections at clusters will provide increased optionality for connection, and this alternative connection would be particularly advantageous in remote areas (where clusters are often located). The TSSPS requirement to secure the proposed connection of a large demand customer to a cluster will be assessed by SONI on a case-by-case basis. Where 110kV network reinforcement is required to comply with the TSSPS, this reinforcement is chargeable to the connecting 33kV demand customer.

- For network reinforcement, NIE Networks continues to consider how assets can be used as efficiently as possible to deliver customer and network benefits. The ability to connect network demand into clusters would increase the efficiency and optionality of future network design and would ensure the minimising of network charges borne by the NI customer. These costs will be socialised to the wider NI customer base, but the additional option of connecting demand to clusters will ensure that all technically acceptable options will have been considered and the most appropriate and cost-efficient reinforcement can be selected. With increased electrification of heat and transport and the subsequent growth of electrical demand, it is vital that NIE Networks are able to utilise all existing assets (including cluster infrastructure) to design a network which is efficient for the NI customer. This is in line with both NIE Networks' and SONI's statutory duties.

Engagement with SONI

NIE Networks agrees with the comment that engagement with SONI is required. As cluster infrastructure contains transmission and distribution infrastructure, this engagement is important for an efficient implementation of the changes proposed in this consultation. NIE Networks recognises SONI's obligation to meet the Transmission System Security and Planning Standards (TSSPS) for the connection of demand and generation to the transmission system. SONI is also required to secure demand groups of 1 MW or above, with the minimum planning supply capacity increasing as the demand group increases.

Therefore, NIE Networks has engaged with SONI to discuss these proposals and moving forward existing mechanisms[22] will be utilised to ensure there is appropriate Transmission and Distribution co-ordination on both network reinforcement projects and large demand customer connections to existing clusters.

Benefits to Generation Customers

One respondent believed that the benefits of connecting demand into cluster substations may not automatically equate to increased capacity to allow increased generation to connect to the cluster, such as for demand connections which may also include embedded generation or zero export schemes. NIE Networks design the connection of generation to zero network load to ensure that if no demand was present no limits would be breached by the connected generation. In this respect, the connection of demand will have no effect on the available generation capacity at a cluster.

However, the TSSPS requirement to secure proposed demand connections at a cluster will be assessed by SONI on a case-by-case basis and may consequently provide additional transformer capacity which can then be utilised by subsequent generation connections, without incurring the cost of the second transformer.

The facilitation of demand at clusters would also reduce electrical losses on the network, reducing the impact of Distribution Loss Adjustment Factors (DLAFs) on network charges for customers.

[22] Transmission Interface Agreement (TIA) planning and connections panels

Benefits of Connecting Demand into Clusters

Following the evidence gathered from stakeholders in the CfE, NIE Networks believes that it is important to clarify at this point the benefits that connecting network and large customer demand to a constructed cluster substation would provide to the NI customers, large demand customers and generators. These clarifications on the benefits presented in section 5.3 of the CfE include additional benefits, greater detail in certain areas and development to the security of supply requirements following further engagement with the TSO. These can be viewed in Table 1.

Benefits to the NI Customer	Efficient Use of Assets	Under the Electricity (NI) Order 1992, NIE Networks has an obligation to develop and maintain an efficient, coordinated and economical system of electricity distribution which has the long-term ability to meet reasonable demands for the distribution of electricity. It is therefore vital that NIE Networks continues to consider how assets can be used as efficiently as possible to deliver customer and network benefits. The potential to connect network demand into clusters would increase the efficiency of future network design and would ensure the minimising of network charges borne by the NI customer. This improved efficiency would also reduce electrical losses on the network, reducing the impact of Distribution Loss Adjustment Factors (DLAFs) on network charges.
	Environmental Conservation	NIE Networks' Environmental Statement[23] states that it will aim to mitigate the impact of its activities on the environment. Accordingly, NIE Networks will always consider the impact of its activities on the environment. If NIE Networks determines an environmental assessment is needed to support a decision an environmental assessment will be carried out by environmental and planning specialists. This was a key factor in the establishment of clusters, as the aggregated length of overhead lines has been greatly reduced by extending the 110 kV network, therefore shortening the 33 kV lines connecting the renewable generation to the network. The same concept can apply to demand connections as a cluster may represent the geographically closest point of connection. The opening up of clusters to demand would prevent the undesirable scenario where a demand connection would be required to bypass a cluster site and connect elsewhere, adding avoidable overhead line lengths to the NI landscape.
	Facilitating Future Energy Targets	Future energy targets will require significant infrastructure build. Considering the increasing difficulties that infrastructure projects face regarding planning and legalities, building the necessary infrastructure to achieve targets will be extremely challenging. Several recent primary substation upgrades have been subject to lengthy delays due to planning and legalities, with specific examples of work sanctioned in 2015 and 2018 still ongoing due to difficulties with landowner engagement. If accepted, connecting demand into clusters will reduce the infrastructure required and therefore increase the likelihood of achieving future targets and ensuring that the network doesn't become a blocker for the uptake of LCTs.
Benefits to Large	Releases Additional Locations for	With 6 clusters already constructed, the opening of clusters to demand would represent a release of previously unavailable capacity. As clusters are often located in remote locations (driven by the location of renewable

[23] https://www.nienetworks.co.uk/documents/environment/environmental-statement-oct-15.aspx

Demand Customers	Demand Connections	generation) the alternative connection option would be advantageous to a large demand customer seeking a connection in such regions.
	May Reduce Costs and Timescales of Projects	A demand customer seeking to connect to the network is offered the Least Cost Technically Acceptable (LCTA) connection. The possibility of connecting a large demand customer into a constructed cluster will provide alternative options for a network connection. This alternative may represent the most cost effective connection by potentially reducing the length of overhead line or underground cable routes, or by preventing the need for costly network reinforcement to facilitate the connection. In certain situations, the timescale for a demand customer to connect to the network could be reduced because of the ability for a nearby cluster to accept demand connections.
Benefits to Generators	Better Security of Supply	Clusters are currently a means of connecting generation, and therefore they do not have any requirement to have a level of security of supply. The addition of demand to clusters could benefit the existing generators at that cluster by reducing the constraint during an outage condition of the existing 110 kV line and transformer and increasing the security of their connection. The TSSPS requirement following the connection of demand to a cluster will be assessed by SONI on a case-by-case basis.
	Improved Power Quality	The requirement for security of supply will reduce the impedance of this section of the network and will consequently increase fault level. Among other benefits, this will help to reduce the impact of generator harmonic current emissions and voltage step changes, making it easier for future generation schemes to remain within the relevant statutory limits and potentially avoiding the need for a costly mitigating solution.
	Additional Generation Capacity Released	Under current arrangements (demand is not connected into clusters), the release of additional generation capacity at a cluster substation would require the reinforcement costs to be borne by the generation connection which triggers the need for a second transformer. The requirement for security of supply may require a second 110/33 kV transformer and 110 kV circuit following the connection of demand to a cluster which will consequently provide additional transformer capacity which can then be utilised by subsequent generation connections, without incurring the cost of the second transformer. It is worth noting that the method of providing transmission and distribution security of supply will be considered by SONI and NIE Networks respectively in line with the TSSPS and DSSPS on a case-by-case basis.

TABLE 1 - BENEFITS OF CONNECTING DEMAND INTO CLUSTER SUBSTATIONS

Consultation Question 3 – "Do you agree with the proposed approach outlined in section 4.1 – 'Drivers and Benefits of Change'? If not, please provide rationale"

4.2 Demand Security of Supply Requirements

At the time of writing, cluster substations solely facilitate the connection of renewable generation and consequently are not required to have any level of security of supply. The CfE described that NIE Networks is governed by statute and by licence in respect of the manner in which it plans, operates and maintains its electrical network. NIE Networks' minimum security of supply planning obligations are defined

by Engineering Recommendation (EREC) P2 (NI) of the Distribution System Security and Planning Standards[24]. Applying EREC P2 to demand connecting at existing clusters necessitates that the demand is appropriately secured.

No specific questions were asked in the CfE with regards to security of supply required at cluster substations as it is NIE Networks view that the requirement for security of supply are clear under EREC P2.

NIE Networks recognises SONI's obligation to meet the Transmission System Security and Planning Standards (TSSPS) for the connection of demand and generation to the transmission system. SONI is also required to secure demand groups of 1 MW or above, with the minimum planning supply capacity increasing as the demand group increases.

4.3 Network and Large Customer Demand Connection Charges

4.3.1 Call for Evidence Proposal

Unlike for generation, there is currently no demand-specific charging methodology for clusters. Therefore, under current arrangements the charging which would apply to any demand which would connect to a cluster would be according to NIE Networks SoCC and would mirror the principles for how demand is charged across the network.

The CfE sought to present the implications of connecting demand into a cluster. It is worth noting that charging principles for all connections will be considered in a full connection charging review which will involve a full consultation process; however, it falls outside the scope of this consultation. It was considered appropriate to present how this would currently be achieved according to the existing SoCC. This approach was used in order to clearly outline the implications of connecting network and large customer demand into clusters.

Key points when the SoCC is applied to demand connections to a cluster are:

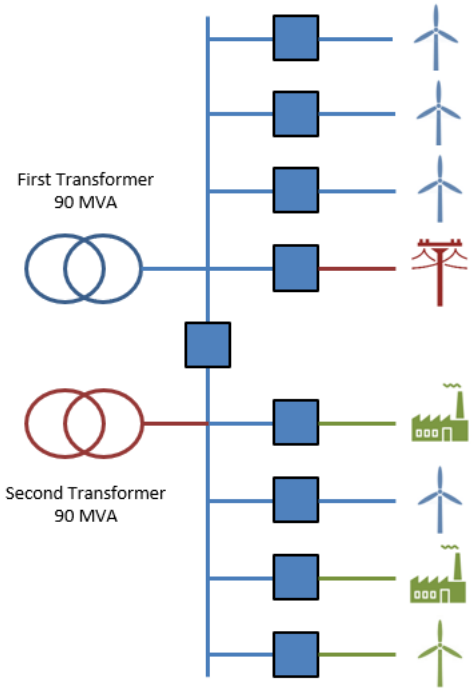
- A large demand customer connection at a cluster, will be required to pay for their connection assets, including any 33kV and/or 110kV infrastructure required to provide security of supply to comply with the DSSPS and TSSPS.
- For network reinforcement projects which will utilise existing cluster infrastructure, the required network reinforcement is funded (including security of supply infrastructure if not already present) through the use of system charges borne by the NI customer.
- Generators seeking to connect are still charged according to the cluster charging methodology.

The CfE then presented three scenarios showing how this charging would be implemented. In order to keep this consultation document succinct only one of these scenarios has been illustrated in this consultation document.

The scenario shown in Figure 2 assumes a cluster substation with initially a single 90 MVA transformer and 110 kV transmission circuit, with 65 MVA of generation already connected (prior to approval for the connection of network and large customer demand at clusters). In this scenario the cost associated with the network reinforcement work, including the additional transformer and transmission infrastructure (assumed to be required in this case following engagement with SONI), is recovered through system charges which are borne by the NI customer. As before, generation connections will still be charged

[24] https://www.nienetworks.co.uk/distribution-code

according to the cluster charging methodology until the cost for the initial cluster infrastructure is fully recovered.



Connection Size (MVA)	Remaining Cluster Generation Capacity (MVA)	Remaining Cluster Demand Capacity (MVA)	Note
25	65	-	
20	45	-	
20	25	-	
30	115	60	Second transformer funded through System Charges
20	115	40	Pays for unique connection assets only
25	90	40	Connection still pays 25/90th of initial infrastructure to ensure cost recovery
15	90	25	Pays for unique connection assets only
20	70	25	Pays for unique connection assets only

Order of Connection

FIGURE 2 – NETWORK AND LARGE DEMAND CONNECTION CHARGES

4.3.2 Call for Evidence Responses

In the CfE, question 14 asked "**Having seen the scenarios above, do you agree with using the existing SoCC to charge demand connections to a cluster? If not, please provide alternative proposals."**

A number of respondents provided their views on how storage is treated from a security of supply point of view, objecting to the need for storage with import capability greater than 1 MW to have security of supply as is the case with a normal demand customer. They highlighted the following points to reinforce their approach:

- Storage is a new technology, and it is not correct to describe it as either just generation or demand. It has its own technical characteristics and needs.
- The categorisation of battery storage as "Generation" for the purposes of licensing by both NIAUR and Ofgem is significant as is the fact that, in respect of use of system charging, Ofgem have classified battery storage as "interim demand" as opposed to "final demand" end user consumers. It therefore seems inappropriate to treat battery storage as a final demand customer for the purposes of compliance with network planning standards.
- It is likely that most storage projects will not require the level of demand security of supply proposed by NIE Networks.

These respondents requested that NIE Networks supports allowing storage projects to have a derogation from this requirement.

Another respondent envisaged situations where different demand and generation requests are made co-operatively within a short period and it was their view that it would be unfair for the first request to bear all the cost in such situations. As a potential solution they would like the SoCC to consider such scenarios and develop options for the sharing of cost between several near-concurrent requests. Another respondent believes that flaws exist within the current charging principles that apply to clusters, relating to a 'cliff edge' effect where the cost implications of being the marginal connection that creates a need for an additional transformer remain too high and considerations should therefore be given to attenuating the extent of the cliff edge effect. They pointed to rebating principles potentially playing a role in softening the impact on the marginal cost of oversubscribing the first transformer.

A respondent proposed that two additional scenarios that facilitate the connection of demand behind the meter are considered in any future consultation. Both of which would facilitate a demand load request from a generator, and therefore an increased Maximum Import Capacity (MIC) to the existing 33kV connection. The respondent highlighted the importance that innovative measures and solutions for energy capture and transformation will play in partially mitigating the financial impact of increased constraint and curtailment.

A respondent reinforced their earlier point that the connection of demand into a cluster site with only one 110 kV circuit would not be appropriate, unless the customer accepts the implications of the supply standard available at that point or funds the upgrade that they trigger.

4.3.3 Proposed Approach

Derogations from Security Standards

A number of respondents (in response to a number of the CfE questions) raised the possibility that demand connections are connected with a lower standard of security of supply to that outlined in EREC P2. NIE Networks acknowledges this possibility should the customer accept this reduced distribution security; however, such a scenario would need to be considered on a case-by-case basis. NIE Networks is ensuring that this consultative process takes account of our statutory and licence requirements and therefore has focussed on the requirements, rather than the derogation of these requirements.

NIE Networks recognises SONI's obligation to meet the Transmission System Security and Planning Standards (TSSPS) for the connection of demand and generation to the transmission system. SONI is also required to secure demand groups of 1 MW or above, with the minimum planning supply capacity increasing as the demand group increases.

Treatment of Electricity Storage

NIE Networks acknowledges that electricity storage is a new technology and cannot be accurately categorised as purely demand or generation. However, electricity storage is capable of being both a demand customer and a generation customer and therefore it is necessary to consider both when designing their connection to the network. This is described in section 5.3.1 of the CfE.

The export of an electricity storage unit will be treated in the same way as other forms of generators at clusters and the electricity storage applicant will be charged according to the cluster charging methodology, which is detailed in section 2.1.1.

In relation to the classification of an electricity storage units demand as being an 'interim demand' or a 'final demand', NIE Networks takes direction from the DSSPS, which includes EREC P2. Engineering

Report (EREP) 130[25], which is a supplementary guide to the application of EREC P2 states in section 9.5 that 'The import from a Non-Contracted ES (Electricity Storage) should be assumed as being accounted in the normal demand profile, i.e. within the Measured Demand[26].' Therefore, the demand required by a storage unit is included in the overall Group Demand, and therefore a level of distribution security of supply is required for connections where the MIC of the storage unit is over 1 MW. SONI is also required to secure demand groups of 1 MW or above, with the minimum planning supply capacity increasing as the demand group increases.

Connection of demand behind-the-meter

NIE Networks acknowledges the role that behind-the-meter demand will play at generation sites in future energy scenarios. For clarification, the connection of behind-the-meter demand and the subsequent increase to the site MIC will be subject to the same principles applicable to other demand connections at clusters (as detailed throughout this consultative process), including the requirement for the demand to be appropriately secured according to EREC P2.

Charging Principles

NIE Networks is making no change at this time to the application of the Least Cost Technically Acceptable (LCTA) charging approach to large demand customers who may be eligible for connection to a constructed cluster substation. Accordingly, connection of a large demand customer to a constructed cluster substation will only be offered where it is the LCTA connection.

NIE Networks acknowledges the suggestions made regarding cost sharing and rebates to reduce the 'cliff-edge' effect (as referred to by a respondent) where the first request is to bear all relevant costs. As has been alluded to throughout this consultative process, charging principles for all connections will be considered in a full connection charging review which will involve a full consultation process; however, it falls outside the scope of this consultation.

TSSPS Reinforcement Chargeability

The TSSPS requirement to secure the proposed connection of a large demand customer to a cluster will be assessed by SONI on a case-by-case basis. The criteria for this assessment are set out in Section 3 (Demand Connection Criteria Applicable to the Onshore Transmission System) of the SONI Transmission System Security and Planning Standards. According to the NIE Networks SoCC, where 110kV network reinforcement is required to comply with the TSSPS, this reinforcement is chargeable to the connecting 33kV demand customer.

Consultation Question 4 – "Do you agree that according to the TSSPS and NIE Networks SoCC, where 110kV network reinforcement is required to comply with the TSSPS, this reinforcement is chargeable to the connecting 33kV demand customer?"

[25] EREP 130 - https://www.ena-eng.org/ena-docs/Index?Action=ViewDetail&EID=99921&tab=dcode

[26] *Measured Demand* - summated demand measured at the normal (network) infeed points to the network for which Group Demand is being assessed

4.4 Cluster Designation Considerations

4.4.1 Call for Evidence Proposal

Currently, the designation[27] of a cluster substation begins with an assessment of all generation anticipated in an area of about 310 km^2 or a 10 km radius. This radius is based on a 12 km maximum length of 33 kV 200 mm^2 aluminium overhead line that, when fully loaded, maintains the 33 kV voltage at the generator within statutory limits. The radius is reduced to 10 km to allow for the route length being generally around 20% greater than the direct distance from the source to the generator. The radius is based upon average conditions and engineering principles and judgement are to be applied to refine any particular case, e.g. it might be possible to use a longer 33 kV overhead line to connect a generator where the voltage rise at the generator remains within the upper statutory limit.

Based on the typical capacity of 33 kV overhead lines (28 MVA) and the need to reduce aggregated overhead line lengths, the threshold for a cluster to be considered is 56 MVA of proposed generation connections. It is worth noting that each generation site's MEC is weighted (as discussed in Section 4.2) according to the development stage of the generation project to take account of uncertainty of a project being completed. Therefore, if the combined weighted MECs of generation sites within the designated area are above 56 MVA then a cluster substation will be considered and NIE Networks will carry out further analysis.

Under the SoCC a large demand customer seeking to connect to the network must be offered the Least Cost Technically Acceptable (LCTA) connection. In order for this offer to be considered technically acceptable, it has to provide a connection to network infrastructure which currently exists. Similarly, for network reinforcement projects, an expenditure allowance is provided for reinforcement works for the subsequent regulatory period. The reinforcement work to alleviate any identified network deficiencies cannot be based on speculative assets, and therefore speculative costings, due to the mitigation proposal taking account of assets which do not currently exist.

4.4.2 Call for Evidence Responses

In the CfE, question 15 asked "**Do you agree that demand should not be considered as part of the designation of a cluster site? If not, please provide reasons why."**

A respondent raised the issue of the treatment of electricity storage at clusters. It was their belief that storage installed behind the meter of a renewable generator complements the performance of the generating facility by being able to take in energy from its own generating facility when there is surplus energy and provide the energy back to the network when it is required by customers. In addition, electricity storage can offer a reduction to the amount of constraint and curtailment experienced by a generator connected to a designated cluster. This respondent suggested that electricity storage does not follow convention and the rules for connecting and operating electricity storage should be reviewed. This comment has been addressed previously in section 4.3.3.

Another respondent disagreed with this proposal and believed that demand should be a consideration in the designation of clusters sites going forward. They believed that the consideration of demand at this stage has the potential to improve the potential efficiency of the network while also providing an additional solution towards reducing constraints. They noted the reasoning for NIE Networks to exclude demand sites from cluster designation but proposed the following solutions:

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[27] *Designated Generation Cluster Infrastructure* means Network Infrastructure including, as appropriate, civil works, electrical lines and cables, electrical plant, meters, telemetry and data processing equipment proposed by NIE Networks as being required for the purposes of connecting a Generation Cluster to the network, prior to its approval for such purpose by the Authority.

- Amending the stipulations in the LCTA process
- Redefine a cluster as no longer being speculative once it has crossed a certain threshold in its development.

However, 77% of respondents agreed that demand should not be considered as part of the designation of a cluster site. Whilst agreeing, a number of respondents believed that potential further demand connections should impact on the location of the cluster. It was the view of another respondent that as the inclusion of demand within the designation process would trigger a higher standard of connection, this should not form part of the designation process.

4.4.3 Proposed Approach

NIE Networks can clarify a threshold for generation customers already exists for when clusters are no longer speculative, this is when the cluster has been granted construction approval by the Utility Regulator. At this point the terms of the connection offer for a generation customer will be revised to take account of the cost of the approved generation cluster infrastructure.

NIE Networks believes that demand should not be included in the designation of a cluster site on the basis that the cluster methodology was introduced in Northern Ireland to facilitate the connection of additional renewable generation and the basis for cluster substations has not changed. The opening of constructed clusters for demand connections is principally to better utilise existing infrastructure, rather than allowing demand connections to influence the location and approval of emerging infrastructure. There is also the consideration of planning standards applicable to demand connections and the initial construction of a cluster being with a single 110/33 kV transformer and 110kV line. Therefore, NIE Networks are not proposing to expand the scope of designation beyond the renewable generation it currently applies to.

A number of respondents agreed that demand should not be included in the designation process but should impact upon the location of a cluster. NIE Networks regards these two points as contradictory. The designation of clusters is based upon the summation of weighted connection capacities reaching a 56 MVA threshold, with these connections within a particular radius (as described in section 2.2 this radius does not preclude the use of engineering judgement). The key driver for the location of the cluster will be the feasible point which provides the most efficient connection for the connections which have contributed to the reaching of this threshold.

Therefore, it is NIE Networks view that the connection of network or large customer demand (including electricity storage connections) should not be considered in the designation of a cluster.

4.5 Allowable Connection Voltage

4.5.1 Call for Evidence Proposal

The CfE described that where a 33 kV circuit, due to being constructed during the time of rural electrification, contains directly connected 33/0.4 kV or 33/0.23 kV transformers it is classified as a 33 kV distribution circuit and can be considered under certain circumstances as the LCTA solution for an LV connection. However, 33 kV circuits which do not have distribution transformers historically connected are designed in order to maximise network performance and capacity. This type of circuit is classed as sub-transmission circuit and therefore the connection of distribution transformers is not permitted.

It is important to mitigate against the risk that cluster infrastructure is only minimally utilised. For this reason, a threshold for connected generation was introduced to ensure that the infrastructure is not used inefficiently. It is important to ensure that any connection of demand also respects this principle and does not represent inefficient use of the assets.

For these reasons, it is NIE Network's view that the connection of distribution transformers to a 33 kV circuit of a cluster substation should not be permitted. Consequently, it follows that only 33 kV (EHV) customers and 33 kV circuits used for network reinforcement, including the connection of new or existing Primary (33/11 kV) substations, are permitted to directly connect to the cluster infrastructure.

4.5.2 Call for Evidence Responses

In the CfE, question 16 asked "**Do you agree that in order to ensure the efficient use of assets, all direct customer connections to a cluster should be restricted to 33 kV connections? If not, please provide reasons why."**

85% of respondents agreed that all direct customer connections to a cluster should be restricted to 33 kV connections. The remaining 15% of respondents neither agreed or disagreed.

Comments included:

- It is important that connecting demand customers does not limit the connections for renewable generators.
- Given that a connection at 11 kV or below could not be charged for transmission reinforcements, permitting connection below 33 kV is unlikely to be consistent with the TSO's duties to develop the system economically and efficiently.

4.5.3 Proposed Approach

NIE Networks agree that it is important that the connection of demand into a cluster does not unnecessarily create a scenario where connections for renewable generators at clusters are limited.

NIE Networks acknowledges that the TSSPS requirement following the connection of demand to a cluster will be assessed by SONI on a case-by-case basis and may consequently require transmission reinforcement following the connection of large customer demand. Any 110kV reinforcement required to ensure compliance with the TSSPS will be chargeable to the connecting 33kV demand customer. The development of the necessary reinforcement works in an economical and efficient manner will enable the TSO to meet its duties.

NIE Networks reinforces that it is important to mitigate against the risk that cluster infrastructure is only minimally utilised. For this reason, a threshold for connected generation was introduced to ensure that the infrastructure is not used inefficiently. It is important to ensure that any connection of demand also respects this principle and does not represent inefficient use of the assets.

NIE Networks welcomes the agreement on this and will limit the connection of large customer demand and network demand to 33 kV customers and 33 kV circuits used for network reinforcement, including the connection of Primary (33/11 kV) substations. NIE Networks will ensure that the SOCC and applicable network design policies are updated to reflect this approach.

4.6 33 kV Busbar Voltage Considerations

As described in the CfE, cluster substations differ from traditional 110/33 kV arrangements (BSPs) in that the voltage at the 33 kV busbar is designed to be 1.0pu, as opposed to BSPs where it is designed to be 1.03pu. Limiting the source voltage to 1.0pu is to provide extra headroom for voltage rise on the 33 kV circuits connecting the generators to the cluster substation, ensuring that upper voltage limits are not exceeded and thereby maximizing the amount of renewable generation that can be connected to a cluster substation. The opposite applies for BSP sites that are normally designed to supply load whereby the

source voltage is maximized to allow for the network voltage drop caused by remote demand connections. This allows the most efficient use of assets that are primarily designed to supply electrical demand. Consequently, increasing the source voltage to maximise demand capacity would compromise generation capacity.

It is NIE Networks' view that, as the primary function of a cluster substation is to maximize the capacity for renewable generation connections, it is therefore required that any connection of demand into a cluster substation should be designed in such a way that it does not compromise this arrangement meaning the 33kV busbar voltage remains at 1.0pu for cluster substations.

4.6.1 Call for Evidence Responses

In the CfE, question 17 asked **"Do you agree that in order to continue facilitating high levels of renewable generation any connection of demand into a cluster should be designed in order to maintain this current 33 kV busbar voltage concession? If not, please provide evidence why."**

92% of respondents agreed that any connection of demand into a cluster should be designed in order to maintain the current 33 kV busbar voltage concession, whilst 8% neither agreed or disagreed. A respondent remarked that any change to this value has the potential to restrict the performance of the existing embedded generators connected to a cluster. They also asked that consideration be given to a periodic review to determine the optimum setting.

4.6.2 Proposed Approach

NIE Networks welcomes the agreement on the 33 kV busbar voltage at cluster and will ensure that the voltage at the 33 kV busbar is designed to be 1.0pu, as opposed to BSPs where it is designed to be 1.03pu. This will ensure that the amount of renewable generation that can be connected to a cluster substation remains maximized while facilitating the connection of large customer and network demand to the cluster.

NIE Networks will ensure that network design policies are updated (and subsequently kept under review) to reflect this approach.

4.7 Transmission/Distribution Interactions

4.7.1 Call for Evidence Proposal

At present, when a cluster is designated and approved by the Utility Regulator, NIE Networks applies to the System Operator for Northern Ireland (SONI) for a 90 MVA MEC on the transmission network. SONI carries out a technical assessment of the transmission system and provides NIE Networks with an offer.

Based on the proposals for cluster substations to facilitate the connection of demand, NIE Networks would have to apply to SONI for an associated Maximum Import Capacity (MIC). As per EREC P2 (discussed in section 4.3.1 a transformer capacity of 180 MVA provides a demand capacity of 90 MVA, allowing for full security of supply.

The NIE Networks' SoCC states in section 7.11 that in circumstances where an Authorised Generator makes an application for connection which has the effect of increasing the electrical capacity required from the Designated Generation Cluster Infrastructure or Approved Generation Cluster Infrastructure or Constructed Generation Cluster Infrastructure above the capacity of the First Transformer and therefore necessitates the installation of a second transformer or a third transformer (where the capacity of a second transformer is exceeded by the connection application) or triggers the need for further transmission reinforcement then that Authorised Generator shall be required to pay for the full cost of the second transformer or the third transformer or further transmission reinforcement (as the case may be) and

associated works notwithstanding that the transformer and / or further reinforcement may subsequently become a shared asset. The SoCC also makes provisions for interactive offers.

4.7.2 Call for Evidence Responses

In the CfE, question 18 asked "**If the need for a second (or third) transformer arises, should NIE Networks apply to SONI for an additional 90 MVA MEC and 90 MVA MIC or apply incrementally each time the need arises for an increased MEC/MIC?"**

69% of respondents favoured an incremental approach for apply for capacity to SONI, while 8% favoured applying for an additional 90 MVA MEC and 90 MVA MIC. 23% of respondents neither agreed or disagreed. Comments provided by the respondents included:

- Due to the interactive nature of connections, NIE Networks and SONI should also adopt a coordinated approach to optimise the utilisation of existing and proposed network assets as generation and demand on the network grows.
- It would not be fair to other generators trying to connect elsewhere in the system if capacity is being reserved at clusters. This is on the basis that the NI consumer is not underwriting the cost of the second transformer for generation. Therefore, the NI consumer is not exposed if the full capacity of the transformer is not utilised. If charging policy changes and the NI consumer is underwriting the cost of the second transformer then this policy would need to be reviewed.
- This would be dependent on whether or not any future charging mechanism would be based on a similar 'per MVA' allocation of the costs of this transformer, or on the basis of the party triggering the need paying for it in full.
- Consideration also needs to be given in the scenario where the need for the second (or third) transformer has arisen from a network/system need rather than a connecting customer application.

4.7.3 Proposed Approach

Upon receipt of an effective connection application, NIE Networks will form a view as to whether the distribution connection might require a transmission construction project. This situation would arise in scenarios where the need for additional transmission infrastructure at a cluster is identified. If in NIE Networks' view a transmission construction project might be required, NIE Networks will submit an application to SONI to provide any necessary transmission works. NIE Networks will apply incrementally to SONI based on the information provided to them by the distribution applicant.

It should be noted that providing the required capacity at clusters will be delivered through the installation of additional 90 MVA transformers and 110kV lines that comply with NIE Networks minimum design standards. However, the requested MEC/MIC will be applied to SONI for incrementally and will be based on the information supplied to NIE Networks in the effective connection application.

Should the need for additional transmission infrastructure arise from a network/system need rather than a connecting customer application, the cost of delivery of that additional transmission infrastructure will be considered in the economic evaluation of all options for system/network reinforcement. The installation of the additional transmission infrastructure may create capacity at a cluster, but it is not guaranteed to deliver the necessary network capacity for additional customer generation or load connections.

Consultation Question 5 – "Do you agree with the proposed approach outlined in section 4.7 – 'Transmission/Distribution Interactions'? If not, please provide rationale"

4.8. Cluster Innovation

The creation of cluster substations has been very successful in facilitating greater connections of renewable generation and has been a major contributor to the whole system drive towards a low carbon future. It marked an innovative approach to anticipatory investment, whilst overcoming capacity, environmental and technical problems and the cluster methodology will continue to be utilised to deliver these benefits and meet future renewable generation targets.

Clusters will continue to play an important role in meeting targets, specifically the DfE target that at least 80% of electricity consumption is from renewable sources by 2030. It is NIE Networks view that moving forward opportunities for flexible and innovative approaches for clusters, which currently are not covered in the SoCC cluster methodology, may become available. Such approaches would be carefully considered and engagement with stakeholders would be crucial.

Consultation Question 6 – "Do you support the use of flexible and innovative approaches for clusters where opportunities to implement such approaches become available? If not, please provide rationale"

4.9. Future Cluster Matters Consultation Question

Consultation Question 7 – "Do you agree with the proposed approach to Network and Large Customer Demand Connection Charges, Cluster Designation Considerations, Allowable Connection Voltage and 33kV Busbar Voltage Considerations in sections 4.3 - 4.6? If not please provide rationale.

5. OVERVIEW OF PROPOSED CHANGES TO STATEMENT OF CONNECTION CHARGES

The implementation of the contents of this consultation would be reflected in NIE Networks SoCC. For clarity, this section seeks to demonstrate to stakeholders how the contents of this consultation would be practically implemented.

Section 3 - Customer Categories

- Removal of term Generator from Generator Cluster to align with proposed changes in definitions.

Section 4 – Authorised Generators

- Removal of term Generation from Designated Generation Cluster Infrastructure, Approved Generation Cluster Infrastructure and Constructed Generation Cluster Infrastructure to align with proposed changes in definitions.

- Removal of term Generator from Generator Cluster to align with proposed changes in definitions.

Section 6 – NIE Networks' Charging Arrangements Applicable to all Customers

- Removal of term Generation from Designated Generation Cluster Infrastructure, Approved Generation Cluster Infrastructure and Constructed Generation Cluster Infrastructure to align with proposed changes in definitions.

Section 7 – NIE Networks' Charging Arrangements for Authorised Generators connecting to the network as part of a Generator Cluster

- Removal of term Generator from Generator Cluster to align with proposed changes in definitions.

- Removal of term Generation from Designated Generation Cluster Infrastructure, Approved Generation Cluster Infrastructure and Constructed Generation Cluster Infrastructure to align with proposed changes in definitions.

- Text inserted to clarify that this section does not apply to customers who are not Authorised Generators connecting to a Cluster.

- Removal of term Generation from Generation Cluster to align with proposed changes in definitions.

- Removal of term Generation from Designated Generation Cluster Infrastructure Connection Capacity, Approved Generation Cluster Infrastructure Connection Capacity and Constructed Generation Cluster Infrastructure Connection Capacity to align with proposed changes in definitions.

- Example in 7.8 updated to reflect charges will be based on MVA capacity.

- Example in 7.15 updated to reflect charges will be based on MVA capacity.

Definitions

- Removal of term Generation in defined term Approved Generation Cluster Infrastructure.

- Removal of term Generation in defined term Approved Generation Cluster Infrastructure Connection Capacity.

- Removal of term Generation in defined term Constructed Generation Cluster Infrastructure.

- Removal of term Generation in defined term Constructed Generation Cluster Infrastructure Connection Capacity.

- Removal of term Generation in defined term Designated Generation Cluster Infrastructure.

- Removal of term Generation in defined term Designated Generation Cluster Infrastructure Connection Capacity.

- Update of First Transformer Definition to reflect changes in other defined terms.

- Removal of the term Generator in defined term Generator Cluster and definition updated to reflect customers who are not Authorised Generator can connect to Constructed Cluster Infrastructure.

- Update of Interactive Connection Application to reflect changes in other defined terms.

Appendix 2 – Methodology for Connecting Groups of Generators to the Northern Ireland Distribution System using Cluster Substations

- Title updated to Methodology for Connection to the Northern Ireland Distribution System using Cluster Substations.

- Text added to the introduction section discussing the update of the cluster methodology to enable the connection of network and large customer demand.

- Geographical Extent of a Cluster – Text updated to reflect increase in radius from 10km to 15km.

- Anticipated Extent of Generation – Weighted to Take Account of Uncertainty – text added to reflect most up to date planning statistics and removal of the “Applied for Grid Connection” category in Table 2.

- Weighted Capacity Threshold for Consideration of a Cluster Substation – text updated to reflect MEC will be calculated in MVA and take account of reactive power requirements.

- Timing – Clarity added to explain the circumstances when the timing provision can apply. Concept of delay amended.

- Removal of term Generation from Designated Generation Cluster Infrastructure, Approved Generation Cluster Infrastructure and Constructed Generation Cluster Infrastructure to align with proposed changes in definitions.

- Addition of Section 8 – Connection of Large Customer Demand to Constructed Cluster Infrastructure, which includes details of the applicable charging arrangements for customers who connect into clusters that are not an Authorised Generator.

- Process flow chart updated to reflect MEC will be calculated in MVA.

6. CLUSTER METHODOLOGY REVIEW CONSULTATION QUESTIONS SUMMARY

NIE Networks welcomes views on this consultation document, particularly in relation to the questions listed below:

Consultation Question 1 – "Do you agree with the proposed approach outlined in section 3.4 – 'Technical Assessment – Geographic Extent of a Cluster'? If not, please provide rationale"

Consultation Question 2 – "Do you agree with the proposed approach to standardisation of capacity allocation, cluster designation, timing and definitions as outlined in the call for evidence and in sections 3.1, 3.2, 3.3 and 3.5? If not please provide rationale.

Consultation Question 3 – "Do you agree with the proposed approach outlined in section 4.1 – 'Drivers and Benefits of Change'? If not, please provide rationale"

Consultation Question 4 – "Do you agree that according to the TSSPS and NIE Networks SoCC, where 110kV network reinforcement is required to comply with the TSSPS, this reinforcement is chargeable to the connecting 33kV demand customer?"

Consultation Question 5 – "Do you agree with the proposed approach outlined in section 4.7 – 'Transmission/Distribution Interactions'? If not, please provide rationale"

Consultation Question 6 – "Do you support the use of flexible and innovative approaches for clusters where opportunities to implement such approaches become available? If not, please provide rationale"

Consultation Question 7 – "Do you agree with the proposed approach to Network and Large Customer Demand Connection Charges, Cluster Designation Considerations, Allowable Connection Voltage and 33kV Busbar Voltage Considerations in sections 4.3 - 4.6? If not please provide rationale.

7. NEXT STEPS AND HOW TO RESPOND

7.1 Next Steps

This Consultation document is the second step in collaborating with key stakeholders on updating the NIE Networks cluster methodology. NIE Networks are keen to ensure that all stakeholders have every possible opportunity to input into these proposed changes. The responses to this consultation will be analysed by NIE Networks and will be used in the development of a decision paper setting out a proposal for implementing the changes to improve the current cluster methodology and to connect large customer and network demand into existing clusters.

7.2 How to Respond

NIE Networks invite interested parties to respond to this consultation. Whilst NIE Networks welcome all comments they particularly welcome comments on the questions presented in section 6 of this document. Responses should be sent electronically to Connor.Carville@nienetworks.co.uk, and copied to Carl.Hashim@nienetworks.co.uk, by 5pm on Friday 9th September 2022.

NIE Networks will handle all information in accordance with the NIE Networks Privacy Statement (http://www.nienetworks.co.uk/privacy).

Please note that it is intended to publish all responses to this paper on the NIE Networks website (www.nienetworks.co.uk). Respondents who wish that their response remains confidential should highlight this when submitting their response.

NIE Networks may share responses with UR. Respondents should be aware that as UR is a public body and non-ministerial government department, the UR is required to comply with the Freedom of Information Act (FOIA)[28].

[28] The effect of FOIA may be that information contained in consultation responses that is shared with UR is required to be put into the public domain. Hence it is possible that all responses made to this consultation that may be shared with UR will be discoverable under FOIA, even if respondents ask for the responses to be treated as confidential. It is therefore important that respondents take account of this and in particular, if asking that the responses are treated as confidential.