Consultation on Connecting Further Generation in Northern Ireland

Call for Evidence

12 October 2017

Northern Ireland Electricity Networks

SONI

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1. Executive Summary

This paper follows on from the recent joint SONI and NIE Networks connections process workshop of 18th August 2017[1]. At this workshop an update of progress made by SONI and NIE Networks in delivering phase 1 of the process, as agreed with industry and other stakeholders, through the 'Alternative Connection Application and Offer Process Consultation' and set out in the resulting decision paper dated 31st May 2016. Furthermore, updates on outcomes of the Utility Regulator's "Review of Electricity Distribution and Transmission connections Policy" decision paper, dated 31st May 2017, were outlined to industry.

The Alternative Connection Application and Offer Process provided an effective means of managing the unprecedented level of generation connection applications received in August 2015, following the change in NIE Networks connections policy where planning permission was removed as a prerequisite for generation connection applications.

This change in policy led to a situation where NIE Networks and SONI were required to consider and process more than 1,800 MW of generation connection applications. This represented an exceptional circumstance when viewed with respect to a congested grid with a peak demand of circa 1,800 MW and an already heavily saturated network with circa 1,570 MW of renewable generation either connected or committed to connect.

The implementation of the Alternative Connection Application and Offer Process released remaining capacity, to a level of circa 200 MW (plus that at existing cluster locations). This outcome is in line with the expectations set back in 2016 with over 200 MW of offers made to over 160 applicants based on meeting criteria designed to best utilise scarce remaining capacity. In addition there is some c146 MW of capacity remaining at clusters and at certain discrete locations. Options for zero export and over install are also available. This release of Offers represents a major success in joint working between SONI, NIE Networks and Industry.

The level of committed and connected renewable generation indicates that the Government target of 40% electricity consumption from renewable sources will be met by 2020. Connecting renewable capacity beyond what is required to meet the current 40% target (i.e. beyond the current level of committed renewable capacity and network capability) will require substantive network investment to support further export from renewables. There is considerable uncertainty around how NIE Networks or SONI might justify any case for such investment without the support of energy policy.

[1] The presentation from the workshop can be found at http://www.nienetworks.co.uk/documents/Connections/Slides-from-Generation-Workshop-2017.aspx

The Phase 1 process was based on iterative transmission assessment cycles in order to exhaust all remaining transmission capacity, which relied on a generation queue and extended processing time. In order to facilitate the Phase 1 process, NIE Networks required extensions to condition 30 of NIE Networks Distribution licence [2]. These extensions were requested by NIE Networks and SONI and approved by the UR.

The primary objective of the extensions was to facilitate the Phase 1 process to exhaust all remaining transmission capacity through iterative transmission studies. The extensions also enabled capacity to be re-allocated from applicants who did not progress with offers, throughout the phase 1 process, to applicants waiting in the queue.

These objectives were strongly supported by stakeholders through the 'Alternative Connection Application and Offer Process Consultation' and through continued engagement with applicants.

As the primary objective of Phase 1 has now been achieved, with all remaining transmission capacity substantially exhausted and no further solutions to the capacity issues available in the near term, the requirement for a generation queue and further extensions are difficult to justify.

Following the Utility Regulator's consultation, "Review of Electricity Distribution and Transmission connections Policy", a decision paper was released on 31st May 2017. This decision paper stated that extensions should now be the exception rather than the norm, thus ending the current extension process that has resulted in the achievement of the primary objective of Phase 1.

Therefore, Phase 1 and the current generation queue will be drawn to a close by the current extension deadline of 30th November 2017. The implications and potential options to progress with generation connections following this decision have been discussed in detail throughout various forums, including the Renewable Grid Liaison Group, over the recent months. This has concluded that the only viable option now available to NIE Networks under its distribution licence, is to issue refusals to connect (as per NIE Networks Electricity Distribution Licence, Condition 30 and the Electricity (NI) Order 1992, Article 21), where there is a lack of capacity to issue a connection offer.

This will result in most applicants within the current generation queue receiving a refusal to connect prior to the 30th November 2017 deadline. Applicants that may be able to avail of the some c146MW of capacity remaining at clusters and at certain discrete locations will not receive a refusal.

However, as Industry has shown a continued high demand to connect further generation schemes, NIE Networks and SONI has, in parallel, initiated a consultation with Industry

[2] Condition 30 of NIE Networks Distribution Licence stipulates that NIE Networks must provide a connection offer no later than 90 days after a valid application is received

(at the Workshop of 18 August) to establish a position on which alternative approaches to conventional investment may be available, in light of challenges . The aim is to take forward solutions which meet the test of being commercially viable for developers and also sit within the wider obligations of SONI and NIE Networks in terms of meeting statutory obligations to develop an economic and efficient grid.

Table 1 below gives an initial outline of the consultation process and associated timescales. Please note that these timescales will be kept under review and are subject to change as the scope of the consultation will be largely dependent on the responses and input of stakeholders. NIE Networks and SONI are keen to ensure that all stakeholders have the greatest possible opportunity to input into and shape the consultation.

Key Milestones	Proposed Dates
Call for Evidence Release	12th October 2017
Call for Evidence Close	3rd November
Publication of Consultation Paper	27th November 2017
Consultation Paper Close	January 2018
Decision Paper	Q1 2018

Table 1: Indicative consultation timeline

2. Introduction

2.1. Purpose of this Paper

The implementation of the Alternative Connection Application and Offer Process has facilitated the release of remaining network capacity, to a level of circa 285 MW (including that at existing cluster locations). With network capacity exhausted and the absence of additional energy policy drivers that might permit an economic case to be made by NIE Networks or SONI, for future network investment, SONI and NIE Networks are seeking input from industry on a way forward for generation connections.

SONI and NIE Networks have initiated a consultation process with Industry (at the Workshop of 18 August) to determine which alternatives there are to the existing NI connection methods and network investment approaches.

Forming the initial step of the consultation, this call for evidence seeks to identify and scope key concepts which will be further explored during the process. The aim is to take forward solutions which meet the test of being commercially viable for developers and also sit within the wider obligations of SONI and NIE Networks in terms of meeting statutory obligations to develop an economic and efficient grid.

The consultation paper due to be published in December will seek to scope and shape the output of this call for evidence into potential new approaches to the connections process.

3. Alternative Connection Application and Offer Process Summary

Following a consultation process with industry stakeholders on an Alternative Connection Application and Offer Process, SONI and NIE Networks issued a Decision Paper[3] in May 2016. The Decision Paper outlined SONI and NIE Networks approach to processing connection applications in the more immediate term and in the longer term. These approaches are referred to as Phase 1 and Phase 2 respectively. The objective of Phase 1 is to release connection offers that will allow for optimal and efficient use of existing grid capacity by ensuring that projects more certain of proceeding are granted access to remaining scarce network capacity. NIE Networks and SONI believe that Phase 1 aligns with important industry views, and our obligations under licence and under legislation. Phase 1 was implemented from June 2016. The basis of Phase 1 process is to couple the strong support from industry that generation projects with planning permission demonstrate more commitment and are much more certain to connect than those that do not have planning permission. Industry also provided equally strong support to prioritise the issue of connection offers to applications where there is remaining grid capacity or where the application has minimal impact on the system.

SONI and NIE Networks believe that the approach adopted, which reflects our respective licence and legislative obligations, ensures the most efficient use of remaining capacity on the grid, provides a mechanism which would allow further use of existing capacity through the concept of 'over-installation' and enables a level of 'zero export' projects to connect, all whilst maintaining system safety and security. Given the responses received by industry, SONI and NIE Networks also proposed an outline approach to deal with the longer term situation.

The purpose of this paper is to launch a consultation to investigate a process that might deal with the longer term situation in the absence of energy policy that would support a case for substantive network investment i.e. an alternative to the phase 2 that was envisioned in the Decision Paper of May 2016.

3.1. Phase 1 High Level Principles

- Exhaustion of all remaining thermal transmission capacity (with respect to generation) on the transmission network (that did not require further reinforcement of the transmission system). In line with the agreed Phase 1 approach, this has now been substantially completed.

[3] Alternative Connection Application and Offer Process Decision Paper: http://www.nienetworks.co.uk/documents/Generation/Alternative-Connection-Application-and-Offer-P-(1).aspx

- An Over Install facility, where a small amount of transmission capacity was reserved to facilitate the increase of the Total Installed Capacity of existing generation sites within a limit of 20% greater than the existing MEC.

- Zero-export connections facilitated, sharing the same limited uncontrollable generation capacity as the Over Install installations, a capacity of 25MW was reserved for zero-export installations. Subject to review of demand for zero-export and Over Install installations, the zero-export limit was subsequently increased to facilitate all applications that were not constrained by other factors.

- Continued support for cluster substations and efficient use of all capacity available at these substations. Capacity remains available at a number of cluster substations, please refer to Appendix A: Cluster Status Update October 2017.

4. Roles and Responsibilities

NIE Networks and SONI work closely together in delivering their respective licence obligations and to ensure that any modifications or expansions to the Transmission and Distribution Systems are efficient, co-ordinated and economical including grid development to facilitate new generation connections. In delivering these licence obligations SONI and NIE Networks identify areas of necessary network investment which are subject to the approval of the UR.

For the avoidance of doubt SONI and NIE Networks are not responsible for setting Northern Ireland energy policy and associated targets or the development and implementation of renewable incentive schemes.

4.1. NIE Networks

NIE Networks is the asset owner of both the Transmission and Distribution Systems in Northern Ireland and is regulated by means of a transmission licence and a distribution licence. These licences require NIE Networks to: plan, develop, maintain and operate the Distribution System; and maintain the Transmission System. In their role as Distribution Network Operator, NIE Networks is subject to a statutory duty to connect (with some specific exceptions) and is required to offer terms to customers for new connections, or for modification of existing connections, to the Distribution System. They are responsible for defining the connection arrangements and identifying any reinforcement works on the Distribution System required to facilitate connection to the Distribution System.

4.2. SONI

SONI is the Transmission System Operator (TSO) in Northern Ireland and is regulated by means of a transmission licence. The licence requires SONI to plan, operate and coordinate/ direct the flow of electricity onto and over the Transmission System. SONI is required to offer terms to customers for new connections, or for modification of existing connections, to the Transmission System. They are responsible for defining the connection arrangements, including any reinforcement works on the Transmission System required to facilitate connection to the Transmission System and Distribution System.

4.3. Transmission Interface Arrangements

The arrangements between SONI and NIE Networks in its role as TO, with respect to the co-ordination of their respective licence obligations, are set out in the Transmission Interface Arrangements (TIA). The TIA also sets out obligations on NIE Networks in its

role as DNO relating to distribution connections requiring works to be carried out on the Transmission System.

These arrangements have been in place since the start of the Single Electricity Market (SEM) in 2007 and have been updated to reflect the transfer of the transmission planning function from NIE Networks in their role as TO to SONI on 1 May 2014.

In addition SONI and NIE Networks are required under Article 12 of The Electricity (Northern Ireland) Order 1992 to develop and maintain efficient, co-ordinated and economical electricity Transmission and Distribution Systems.

Therefore the TSO and the DNO must ensure that any modifications or expansions to the Transmission and Distribution Systems are efficient, co-ordinated and economical and this includes grid development to facilitate new generation connections.

5. Renewable Generation Connections Status

The electricity network in Northern Ireland is facing an unprecedented demand for the connection of renewable generation. Currently c.18,000 renewable generation connections have been completed in Northern Ireland, comprising of c.1000 Large Scale Generation[4] (LSG) schemes and Small Scale Generation[5] (SSG) schemes, as well as c.17,000 micro generators (<16 A per phase). This equates to a total of 1,386 MW of renewable generation now connected in Northern Ireland.

There are a further 385 MW of LSG and SSG schemes committed to connect, bringing the total committed and connected renewable generation levels to just under 1.8 GW. This represents a fantastic achievement by all stakeholders, particularly when viewed against a relatively low minimum system power demand of c.0.5 GW and maximum system power demand of c.1.8 GW, illustrated in Figure 2**.**

Figure 1 shows the levels and types of renewable generation connected and committed to connect.

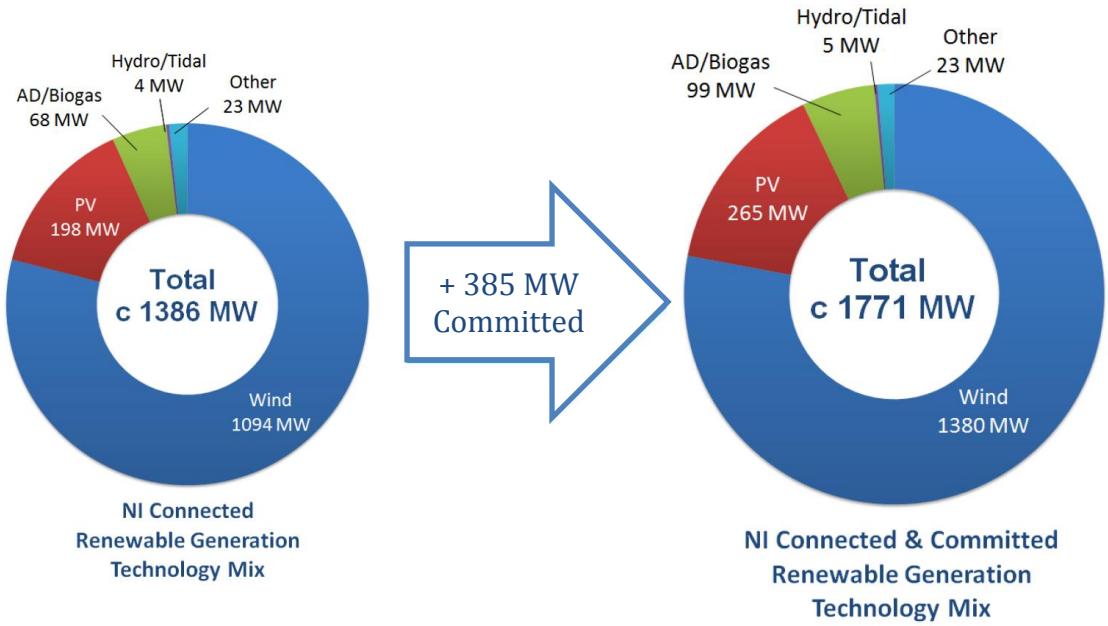

Figure 1 Connected and Committed Renewable Generation Profile, Northern Ireland, 30th September 2017

This feeds into Northern Ireland's performance against the 2011-15 Programme for Government target which is to "Encourage achievement of 20% of electricity consumption from renewable sources by 2015" and the Executive's 2010-20 Strategic

[4] LSG > 5 MW
[5] SSG < 5 MW

Energy Framework which includes a target to achieve 40% of electricity consumption from renewable sources by 2020.

Whilst the closure of the Northern Ireland Renewables Obligation (NIRO) and DfE's 2015 review of the 2020 renewables target raises some uncertainties around the extent and pace of renewables growth in Northern Ireland going forward, it is important to note that even at present the transmission and distribution networks cannot provide, on an unrestricted basis, for all of the connected and committed renewable generation. Whilst there is ongoing development of the transmission system, further reinforcement will be necessary to continue to address restrictions as this further generation connects to the network, as shown by Figure 2**.**

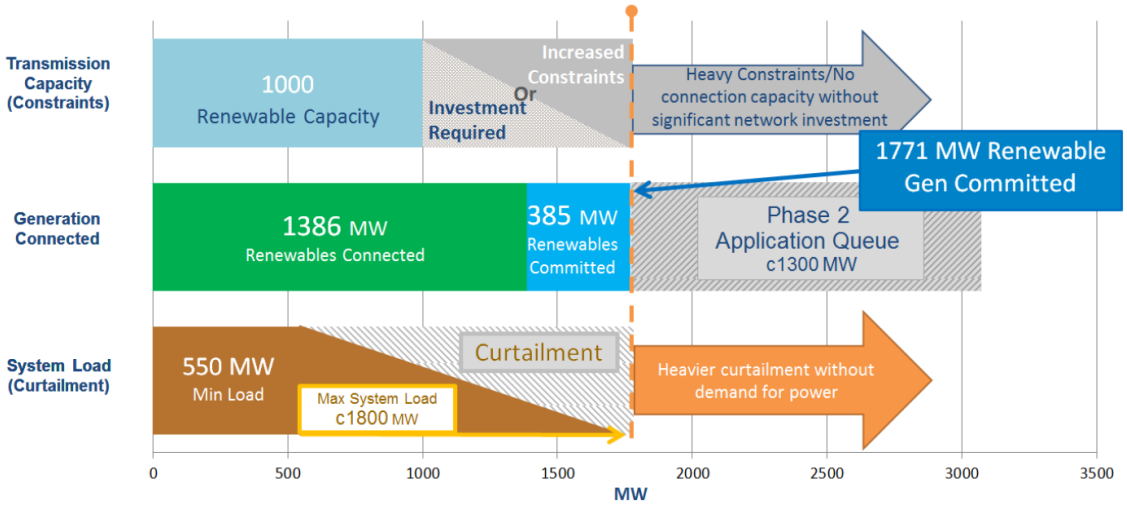

Figure 2 Renewable Generation Status vs Transmission Capacity and Northern Ireland System Demand, 30th September 2017

6. Network Capacity and Operational Capability

The following sections aim to provide more detail on capacity assessment, the capacity issues that exist on the network and background information on how these issues have occurred.

Figure 3 (as presented and explained at our joint industry workshop) aims to illustrate the various points on the network where capacity is assessed and queued for.

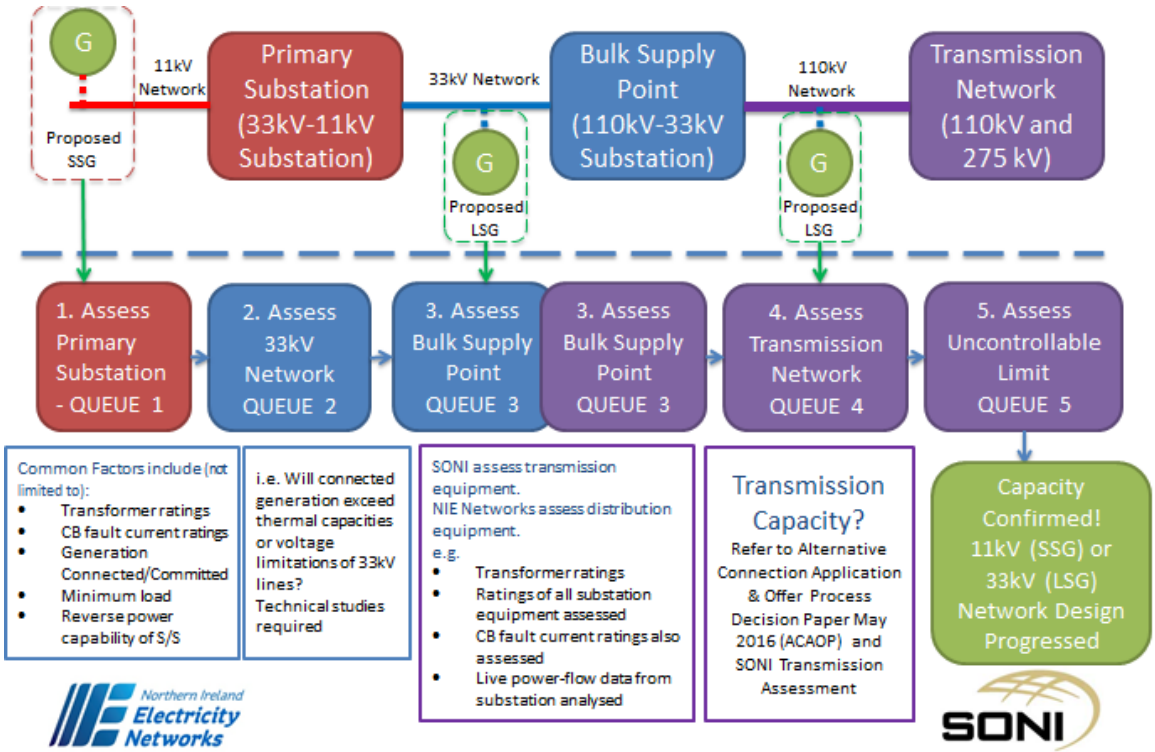

Figure 3: Illustration of Phase 1Network Capacity Assessment and Capacity Queuing

6.1. Distribution System Capacity

6.1.1. 33/11kV (Primary) Substation and 33kV Line Assessment

The initial points of assessment, as shown in points 1 and 2 of Figure 3, to determine if capacity is available to connect a generation scheme are the 33/11kV substation and the 33kV circuits which feed the substation (where the generator is connecting to an LV or 11kV supply point, typically generators with a capacity of less than 5MW).

At a high level summary of the key assessments, the capacity assessment involves analysing normal and fault ratings of circuit breakers, bus bars, transformers and tap changers within the substation, it also involves voltage and power flow analysis of the 33kV lines under various scenarios as per standard network planning practice. This

analysis is performed to ensure that there is capacity available to facilitate the safe connection of the generator while ensuring the distribution system is maintained within statutory limits. Where capacity is restricted, a queue for that capacity is then formed at the 33/11kV substation.

Figure 4 illustrates the c230 33/11kV substations across Northern Ireland. Due to high demand for generation connections across the past 6 years, a number of these substations do not have any remaining capacity to facilitate the further connection of generation schemes.

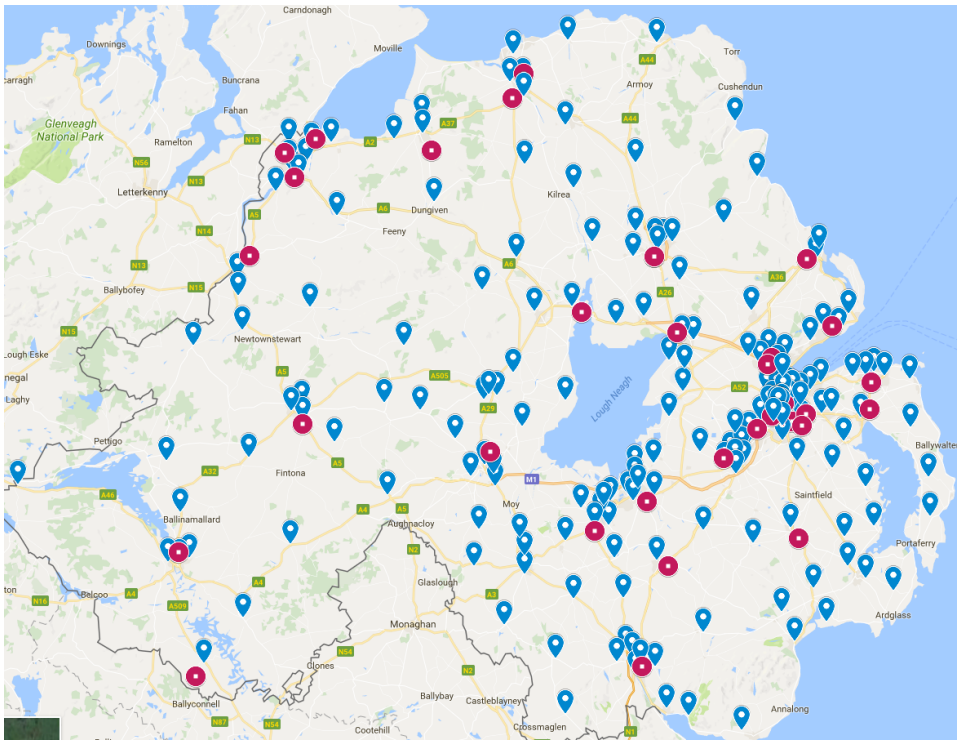

Figure 4: Map displaying Bulk supply point substations (110/33kV, Red) and Primary Substations (33/11kV, Blue) across Northern Ireland

6.1.2. Primary Substation Capacity Investment

The lack of capacity at these substations became an issue for connections around 2012, typically with rural substations being worst affected as the demand for the connection of rurally located wind turbines was exceptionally high while the power usage in the local area is typically low.

Having recognised this issue, a number of substations were identified where upgrades could be made in a cost effective manner in order to facilitate further connections. £4.7M investment was brought forward within RP5 in order to address capacity issues across approximately 80 such substations, facilitating the further connection of over 100 generation schemes.

A managed connection pilot was also pursued with the aim of facilitating further connections in the absence of traditional network investment and connection methods. The principle of managed connections is to employ Active Network Management technology in order to match the levels of generation output from local generators to the local power demand.

While the pilot was able to provide proof of concept, Industry withdrew support for pursuing the program due, largely, to prohibitive costs for the new technology which increased connection costs, reduced revenues due to curtailment of the generator's output and closure of the NIRO scheme which more generally made the financial viability of small scale generators even more challenging.

As demand for generation connections has remained extremely high, it is now the case that a number of these substations have no remaining capacity to further connect generation schemes to the network.

6.1.3. Load Erosion

In recent years the emergence of energy efficiency measures and large volumes of micro generation has resulted in a reduction in the minimum power demand from local substations. This can result in areas of the network becoming exposed to reverse power flows for which it has not been designed and is not capable of facilitating. The local demand in many cases was relied upon in order to enable the connection of generators in that locality i.e. the local demand is required in order to utilise the power generated by the locally connected generation schemes.

NIE Networks has recognised this issue and has planned for £10M of investment through RP6 in order to address this issue and to accommodate the generation schemes that have already been connected to the network. To summarise; this investment will prepare the 33kV network, which connects all of the 33/11kV substations, for the reverse power flows associated with the existing levels of distributed generation connections should the minimum power demand at local substations reduce.

It is important to note that this investment will not enable the further connection of generation schemes that export to the network and the investment required to facilitate further export generation schemes across c230 substations, if traditional connection methods were to be followed, would be substantially higher and would incur significant delivery timescales due to the complexity of works that would be necessary.

Licence modifications pursuant to the RP6 final determination now include a mechanism for NIE Networks to seek additional investment to address 33kV congestion issues in RP6, however any such case for this investment would be difficult to justify given the large investment required, the lack of legislative backing to do so (given that Northern Ireland is on track to meet current targets for renewable electricity consumption with the

current levels of connected and committed renewable generation) and the upstream transmission capacity constraints that are detailed in the following sections.

6.1.4. 110/33 kV Substation ('Bulk Supply Point') Assessment

The next step in the capacity assessment process (point 3 Figure 3) is the 110/33kV main substation that feeds out to the more localised 33/11kV substations via the 33kV lines that have been mentioned in the paragraphs above. This assessment covers much of the same analysis as at the 33/11kV level with ratings of all equipment being analysed and a further generation queue applying where capacity is restricted (capacity is now restricted at almost every 110/33kV substation in Northern Ireland with certain exceptions such as the new cluster substations that have been constructed or are at various stages in their respective delivery processes).

It is important to note that fault level capacity is also considered in the assessment and queuing process. This applies to all generation connected in parallel with the network, even those that do not export power to the network under normal operation.

As the 33/11kV substations are connected downstream of the 110/33kV substations and utilise the capacity of the 110/33kV substation, a generation connection applicant, seeking connection to the LV or 11kV network must enter the localised capacity queue at the 33/11kV substation and also enter the wider queue at the 110/33kV substation.

The 110/33kV transformers are the interface between the distribution system, where the planning of the system is the responsibility of NIE Networks, and the transmission system, where SONI takes responsibility for the planning of the system. The capacity assessment of these transformers and deeper into the transmission network is covered in the following section where applicants in the 110/33kV queue also sit in a globalised transmission queue for capacity on the transmission network.

6.2. Transmission System Capacity

The transmission system in Northern Ireland comprises of 275 kV and 110 kV circuits and substations. It is the TSO's responsibility to plan and develop the Transmission System to facilitate connection of generation and demand growth in accordance with the Northern Ireland Transmission System Security and Planning Standards.

Applications for large scale (LSG) and small scale (SSG) generation, both at transmission and distribution are assessed for their impact on thermal, voltage and fault level compliance against the NI Transmission Security of Supply and Planning Standards (TSSPS). The assessment against the TSSPS ensures the impact of additional generation connecting to the system is fully assessed against a number of robust system security contingencies.

There has been significant growth in the level of renewable generation connections in Northern Ireland. As of 31st May 2017 1300MW of renewable generation has been connected with a further 500MW committed to connect. This is against a maximum system load in Northern Ireland of around 1,800 MW and a minimum system load of around 500 MW.

The Alternative Connection Application and Offer Process Decision Paper[6] published in May 2016 outlined SONI and NIE Networks approach to processing connection applications post influx. The paper identified that there was there very limited capacity available on the Northern Transmission System for the connection of generation in the absence of further reinforcement of the network beyond what is already planned. The NIE Networks and SONI Decision Paper, issued on 31 May 2016 has released remaining capacity, to a level of circa 285MW (including capacity at existing cluster locations). This outcome is in line with the expectations outlined in 2016 with over 200MW of Offers made based on applicants meeting criteria designed to best utilise scarce remaining capacity.

6.2.1. Network Investment

SONI has identified a number of network reinforcement projects which are required to facilitate generation already committed to connect pre influx, Table 2 shows the transmission projects that are required. Some of these projects are complete or are in the process of being delivered, but some of the projects are not yet at the delivery stage. When the transmission projects that are in the process of being delivered are completed, the level of generation already committed to connect is still in excess of the firm[7] capacity available on the Transmission System.

Project/Plan	Stage of Delivery
Increase the capacity of the 110 kV circuit from Omagh to Dungannon	Complete
Increase the capacity of the Tamnamore 275/110 kV substation and the reconfiguration of 110 kV circuits at Tamnamore substation	Complete
Increase the capacity of the 110 kV circuit from Coleraine to Kells	Complete
New 110 kV circuit from Omagh to Tamnamore	Close to completion

[6] Alternative Connection Application and Offer Process Decision Paper: http://www.nienetworks.co.uk/documents/Generation/Alternative-Connection-Application-and-Offer-P-(1).aspx

[7] Firm access is a measure of the transmission capacity available to generators connecting to either the Transmission System or the Distribution System. It is permissible to connect a certain level of generation in excess of firm capacity so long as it is possible to constrain its output to avoid overload or an impact on voltage performance.

North – South 400 kV Interconnector from Turleenan to Woodland	In progress
Voltage support at Coleraine, Omagh/Omagh South and Tamnamore	Pre-construction outline design
Kells –Rasharkin 2 – New 110kV Line	Pre-construction outline design
Ballylumford – Eden 110kV Double Circuit re-string Eden – Carnmoney 110kV Double Circuit re-string Carnmoney – Castlereagh 110kV Double Circuit re-string	Project Definition
Reinforcement of Western Network	Project Definition

Table 2: *Status of transmission reinforcement projects to facilitate generation connected and committed to connect*

To accommodate further RES beyond those already committed and offered significant additional reinforcement of the Transmission System would be required beyond what has been identified in Table 2. In delivering Phase 1 the total export capacity of connected and committed renewable generation now exceeds the Northern Ireland maximum demand of 1800MW. The level of committed and connected renewable generation indicates that the Government target of 40% renewable electricity consumption from renewable sources will be met by 2020. The meeting of this target and the absence of further development of energy policy presents considerable uncertainty around how NIE Networks or SONI might justify further substantive network investment to support export from renewables at transmission or distribution level.

6.3. Operational Challenges

In addition to ensuring that the capacity available on the Transmission System and Distribution System is sufficient to accommodate the generation seeking to connect, consideration must also be given to how the Transmission and Distribution Systems can be managed operationally.

There are technical challenges associated with operating the system with increasing levels of renewable generation for both NIE Networks and SONI. These need to be overcome to better manage the system with the renewable generation already connected, committed to connect and seeking to connect.

This section explores some of the operational challenges that the TSO and DNO are currently experiencing.

6.3.1. Variability of Renewable Generation

With a general increase in the uncertainty of generation and demand the ability to "control" a significant proportion of the system is imperative. Policy initiatives, including support for renewables, have led to an increase of weather dependent generation technologies. These are more variable in their output than classic generation and are building at lower unit sizes. The challenges associated with this output variability should not be underestimated.

In that regard SONI, along with EirGrid, the TSO in Ireland, has developed the "Delivering a Secure Sustainable Power System" (DS3) programme, and are working in conjunction with NIE Networks and ESB Networks, to address these challenges and other issues associated with the large scale deployment of renewable generation.

6.3.2. Visibility and Control of Generation

The TSO currently has the right and has developed the procedures to control the active power output of wind farms of 5 MW and above and the active power output of synchronous generating units of 10 MW and above connected to the Transmission System or the Distribution System as set out in the Grid Code. Generators in these categories are referred to as "controllable" generation in this paper.

The TSO currently does not have control of the active power output of wind farms and PV less than 5 MW nor the active power output of synchronous generating units of less than 10 MW. Generators in these categories are referred to as "uncontrollable" generation in this paper.

As the level of uncontrollable generation connected to the system grows there will be increasing challenges to maintain security of supply.

The two primary challenges for the TSO and DNO in relation to the increasing levels of small scale uncontrollable generation from a real time system operations perspective is visibility and control.

The TSO has the responsibility to balance generation and demand on the system and is required by licence to balance generation that is subject to central dispatch in the SEM and the demand taking into account "electricity delivered to the All-island Network from generation sets not subject to central dispatch". Therefore in order to adequately forecast system demand the TSO must have visibility of the generation that is not subject to central dispatch i.e. the uncontrollable generation that is connected.

The lack of visibility impacts on the TSOs ability to forecast system demand which in turn has implications for the TSO in adequately and efficiently scheduling SEM generation. Additional generation will need to be scheduled which may subsequently need to be reduced or 'curtailed' to manage system demand if uncontrollable generation is also exporting. This will increase dispatch balancing costs and ultimately costs to the end customer.

The TSO must also ensure, among other things, that there is adequate control of the system frequency. System frequency is maintained at 50 Hz across the island when there is a balance between customer demand and generation supply. When these are not in balance the frequency moves away from 50 Hz, potentially causing system security issues and damage to plant and customer equipment connected to the system.

For example an excess of generation will cause the system frequency to increase above 50 Hz. The SONI control centre can manage an over frequency event by reducing generation output through curtailment. If the only generation available for curtailment is in fact uncontrollable, the system frequency cannot be reduced. In addition there are often security constraints on the power system which require additional "must run" generation units to be scheduled that in turn increases the minimum amount of synchronous generation required at any given time.

Furthermore, the more uncontrollable generation that is connected then more curtailment of controllable generation will be required.

6.3.3. System Non-Synchronous Generation

A further consideration other than variability, visibility and controllability is the increasing level of non-synchronous generation connecting to the system. Through the DS3 programme it has been identified that with appropriate changes to policies, tools and performance of all generation plant on the system, it is possible to securely operate the

power system with an instantaneous penetration of these non-synchronous technologies of up to 75% of the system generation by 2020 (including exports/imports to Great Britain). This limit, known as System Non-Synchronous Penetration (SNSP), is currently at 60%. Increasing to 75% will reduce the curtailment of these technologies going forward. The operational limits are largely independent of the need for necessary network infrastructure to connect these assets.

While SONI is working with the industry and regulator to move this SNSP up to 75% by 2020 the TSOs need to curtail the output of controllable non-synchronous generation (wind, solar and HVDC technologies) at times to maintain SNSP within the current limit. As the level of these renewable non-synchronous technologies grows controllable wind, solar and HVDC technologies will need to be increasingly curtailed to maintain system security. This needs to be factored into consideration of connection policy.

6.3.4. Summary of Operational Challenges

To summarise, the operational challenges faced by the TSO and DNO in relation to managing the system in real time with increasing levels of renewable and uncontrollable generation are:

- Maintaining energy balance becomes progressively more difficult as the proportion of uncontrollable and weather dependent generation increases. Visibility and control of a greater proportion of the generation mix is a key mitigation measure. This is in line with the new ENTSO-E Network Code on the Requirements for Generators which states that visibility and controllability can be required for generators as low as 100 kW. The generator size from which generators should be controllable will therefore need to be reviewed.
- As the level of non-synchronous generation connecting to the system increases, the level of curtailment will increase. While SONI are working with the industry to increase SNSP the potential volume of these technologies in the absence of significant complementary demand for electricity, it is likely to require significant curtailment to maintain system security. This curtailment is largely independent of necessary network build to connect the assets.

7. Next Steps

Now that, in line with the approach agreed in Phase 1, remaining transmission capacity has been substantially exhausted, (except for those specific circumstances previously referred to, e.g. clusters), NIE Networks will be unable to issue further export distribution offers to the majority (c95%) of applicants in the current generation queue and will be issuing a refusal to connect to these applicants prior to 30th November 2017 (as per NIE Networks Electricity Distribution Licence, Condition 30 and the Electricity (NI) Order 1992, Article 21).

However, as Industry has shown a continued high demand to connect further generation schemes, NIE Networks and SONI have, in parallel, initiated a consultation with Industry (at the Workshop of 18 August) to establish a position on which alternative approaches to connections may be available, in light of challenges. The aim is to take forward solutions which meet the test of being commercially viable for developers and also sit within the wider obligations of SONI and NIE Networks in terms of meeting statutory obligations to develop an economic and efficient grid.

This Call for Evidence is the next step in this consultation process. The aim of this Call for Evidence is to maximise the opportunity for all stakeholders to feed into and shape the main consultation. Section 8. Summary of Call for Evidence Questions' outlines a high level summary of the main areas for consideration.

7.1. Proposed Timetable

Key Milestones	Proposed Dates
Call for Evidence Release	10th October 2017
Call for Evidence Close	3rd November
Publication of Consultation Paper	27th November 2017
Consultation Paper Close	January 2018
Decision Paper	Q1 2018

Table 3 Proposed consultation timetable

7.2. Request for Comment

NIE Networks and SONI invite interested parties to respond to this call for evidence.

Responses should be sent electronically to ConnectionDesign@NIENetworks.co.uk and Connections@soni.ltd.uk by **4pm on Friday 3rd November 2017.**

Please note that SONI and NIE Networks intend to publish all responses to this paper on their websites (www.soni.ltd.uk and www.nienetworks.co.uk) Respondents who wish that their response remain confidential should highlight this when submitting the response.

SONI and 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)[8].

[8] 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.

8. Summary of Call for Evidence Questions

At our joint industry workshop we were keen to listen to all stakeholders and appreciate the engagement and valuable input.

We would like to continue this successful engagement by opening this Call for Evidence to allow all stakeholders to formally submit evidence and have an influence on how we might progress and facilitate further connections.

We have outlined the following 3 key areas that we encourage stakeholders to consider and provide written response including supporting evidence for the suggested approach:

- Market Information
- Solutions to Capacity Restrictions
- Capacity Allocation and Connections Process

We have included 'Suggested points for consideration' under our three main headings. Please feel free to expand on and include information on other points outside of these suggested points for consideration.

8.1. Market Information

In order to inform the creation of new solutions and a new process, we require information on the type of connections that customers require.

Suggested points for consideration:

There is a need to build a picture of the demand for connections in order to scope solutions that might facilitate those connections.

- Has the demand for certain types or sizes of generators changed in this post-NIRO era?
- Are applicants seeking to connect with a view to trading in prospective future markets?
- Has the development of new and existing technologies had an impact on the market for generation connections?
- If suggested solutions to capacity restrictions would result in connections with restricted network access, what sort of access is viable for a generator and what

information would the applicant require in order to make commercial decisions regarding the connection offer?

8.2. Solutions to capacity restrictions

We welcome all responses on how, given the issues detailed in this paper, we might overcome those issues.

Suggested points for consideration:

- Are there alternate connection methods that would be viable from an industry perspective?
- What level of curtailment becomes unfeasible for generators (either financially or technically)?
- Should consideration only be given to capacity solutions that do not impact upon existing connected generation (i.e. increase constraint/curtailment levels)

8.3. Capacity Allocation and Connections Process

Please consider providing information on any suggestions you would have on capacity allocation and the connections process. Particularly with respect to any capacity solutions that you may also have put forward.

Suggested points for consideration:

- Should NIE Networks and SONI introduce milestones into the connection offers to reduce capacity hoarding?
- Up until this point, capacity hoarding has not been an issue in Northern Ireland. due to the majority of applicants having secured planning permission and the NIRO deadlines. Without these two factors in play going forward, capacity hoarding may become a more prevalent issue that we need to prepare for. You may wish to refer to the ENA Milestones Best Practice Guide[9]
- Are there solutions that could enable customers of existing generation or load sites to gain greater benefit from their connection? i.e. similar to the zero-export and overinstall type solutions that were brought forward through the ACAOP.
- What principles of capacity allocation/sharing through alternate connection methods should be considered?

[9] ENA Progression Milestone Best Practice Guide: http://www.energynetworks.org/assets/files/news/publications/Reports/ENA%20Milestones%20best%20Practice%20Guide.pdf

9. Appendix

9.1. Appendix A: Cluster Status Update October 2017

Cluster update October 2017

Cluster	Present denominator (MW)	Connected (MW)	Committed (MW)	Remaining Capacity (MW) - not yet committed	Applications - (Awaiting Planning/ Quotation)
Magherakeel	138	119.2	0	18.8	23.4 (with Planning)
Gort	90	56.5	11	22.5	22.5
Tremoge	90	65	12.15	12.85	223.09
Rasharkin	90	93.7 (84.6 MEC)	5.4	0	130
Curraghmulkin (Drumquin)	90	0	88.6	1.4	132.20
Agivey (Garvagh)	90	0	90	0	105.6
Kells	90	0	0	90	147.30

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